PROJECT MANUAL

for

SNELLVILLE BRISCOE PARK COMMUNITY RECREATION CENTER

SNELLVILLE, Georgia

December 9, 2024

ISSUE FOR CONSTRUCTION

Prepared By

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GMC PROJECT NUMBER: AATL230037

OWNERSHIP OF DOCUMENTS AND DISCLAIMER

The Project Manual, Technical Specifications, Drawings, and all other documents relating to this project have been prepared for this individual and particular project, and for the exclusive use of the original Owner, developer or other party so indicated.

Actual project conditions and as-built conditions may vary significantly. Changes made during bidding, negotiations, construction, due to additions or deletions of portions of this project, and/or for other reasons, may not be indicated in these documents.

These documents may not be used or relied upon as a certification of information indicated, or used for any other project, by any third parties or other parties, for any purpose whatsoever, without the prior written consent of Goodwyn Mills Cawood, LLC, or prior to receipt of mutually agreed to compensation paid to Goodwyn Mills Cawood, LLC, therefor.

Goodwyn Mills Cawood, LLC
Post Office Box 242128
Montgomery, AL 36124-2128
and
Birmingham, Alabama
Andalusia, Alabama
Auburn, Alabama
Daphne, Alabama
Eufaula, Alabama
Huntsville, Alabama
Mobile, Alabama
Vernon, Alabama
Pensacola, Florida
Sarasota, Florida
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ARCHITECTURE■ENGINEERING■ENVIRONMENTAL■GEOTECHNICAL■INTERIOR DESIGN
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PROJECT MANUAL
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DOCUMENT 001113

ADVERTISEMENT FOR BIDS

1.1 PROJECT INFORMATION

A. Notice to Bidders: Bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.

B. Project Identification: T.W. Briscoe Park Community and Recreation Center, Snellville, GA

1. Project Location: 2500 Sawyer Pkwy SW, Snellville, GA 30078

2. Owner: City of Snellville, 2342 Oak Road, Snellville, GA 30078.

3. Owner's Representative: Matthew Pepper

C. Architect: Goodwyn Mills Cawood, LLC. (GMC)

1. Architect's Representative: Mark Videkovich

D. Project Description: Project consists of a new 34,276 square foot multi-level community recreation center. The building will be constructed in accordance with 2018 International Building Codes with Georgia Amendments, Construction type will be Type IIB construction. The facility will be fully conditioned and will include support spaces such as; restrooms and storage. Work indicated in the Contract Documents. The site work will include a new parking area and supporting utilities.

E. Construction Contract: Bids will be received for the following Work:

1. General Contract (all trades).

F. Funding Sources:

1. The project will be funded with a combination of local and federal funds. The federal funds will come from the Gwinnett County Community Development Block Grant program and therefore services provided must comply with all applicable federal government statutory and regulatory requirements. These requirements are listed under Section 1.7 of this bid advertisement.

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Bid Date: **January 28, 2025**
2. Bid Time: **2:00 p.m.**, local time.
3. Location: **2342 Oak Road, Snellville, GA 30078.**

B. Bids will be thereafter publicly opened and read aloud.

1.3 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of **5** percent of the bid amount. No bids may be withdrawn for a period of **60** days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID MEETING

A. Prebid Meeting: A Mandatory Prebid meeting for all bidders will be held at **2342 Oak Road, Snellville, GA 30078 in the Conference Room.** on **January 7, 2025, at 2:00 p.m**., local time. Prospective prime bidders are required to attend. Site visit if desired will occur following the pre-bid meeting

1.5 DOCUMENTS

A. Electronic Documents will be provided via email correspondence or by other electronic distribution as preferred by the Architect. Documents will be provided to prime bidders only; only complete sets of documents will be issued.

B. In addition, the Contract Documents, consisting of Advertisement for Bids, Information for Bidders, Bid Proposal Form, Form of Agreement, Drawings, Specifications, and bid forms of Bid Bond, Performance Bond, Payment Bond, Bidders Qualifications Forms, and other Contract Documents may be examined at the following locations:

City of Snellville 2342 Oak Road, Snellville, Georgia 30078 (770) 985-3500 mpepper@snellville.org	**LDI-Ga, Norcross** 3030 Business Park Drive, Suite A Norcross, Georgia 30071 (770) 263-1010 Norcross@ldireproprinting.com
McGraw-Hill Dodge Construction OR Online Dodge Data & Analytics – Free 4170 Ashford-Dunwoody Road, Suite 200 Atlanta, GA 30319 (404) 255-2565	**National Association of Minority Contractors** 670 Village Trace, Building 19, Suite C Marietta, GA 30067 info@namcatlanta.org Mr. Vic Verma (678) 325-2960 Vverma@alphaiwp.com Mr. Arthur J. Queen (404) 288-9521 ajqueen@egmatlanta.com

Construction Market Data (CMD) Group 30 Technology Parkway South, Suite 100 Norcross, GA 30092 (770) 417-4000	**Hispanic Contractors Association GA** 2215 Lawson Way Atlanta, GA 30341 Mrs. Patricia Arispizabal (404) 229-8070 info@georgiahca.org
AGC Builders Exchange 1940 The Exchange, Suite 300 Atlanta, GA 30340 (678) 298-4128	

1.6 TIME OF COMPLETION

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time.

B. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

1.7 FEDERAL FUNDING REQUIREMENTS

A. Attention of bidders is particularly called to the requirements regarding conditions of employment and minimum wage rates to be paid on this project, and that the contractor and subcontractor must comply with all Federal, State, and local requirements. Minority and female owned firms are encouraged to participate in this federally funded project. Procurement will be in compliance with the Uniform Administrative Requirements, 2 CFR 200.318-326. Potential respondents are particularly called to the requirements of Title VI; Civil Rights Act of 1964 and 24 CFR 570.602; and Executive Order 11246 - Equal Employment Opportunity and Affirmative Action. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 USC 1701u (Section 3). The purpose of Section 3 is to ensure employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall to greatest extent feasible, be directed to low-and very–low-income persons, particularly persons who are recipients of HUD assistance for housing. For more information on Section 3, contact the Fair Housing Act and Equal Opportunity representatives of HUD at (404) 331-5001, Ext. 2473. Neither the United States nor any of the departments, agencies, or employees is or will be a party of any contract awarded pursuant to this invitation to bid.

In order to assure that Bidders receive all addenda and or clarifications to the bid documents in a timely manner, it is highly recommended that all bidders obtain at least one complete set of Bid Documents directly from the Company, Inc. Entities that do not obtain Bid Documents from this source will not receive addenda and or clarifications to the bid documents directly from the Company, Inc. Bidders relying on plan rooms or other services to obtain the Bid Documents, rather than obtaining them directly from the source are doing so at their own risk.

1.8 NOTIFICATION

A. This Advertisement for Bids document is issued by Mark Videkovich, Goodwyn Mills Cawood (GMC), LLC, 6120 Powers Ferry Road NW, Suite 200, Atlanta, Georgia, 30339
   1. Email: mark.videkovich@gmcnetwork.com
   2. Phone: (770)-919-5052

END OF DOCUMENT 001113

BID REQUIREMENTS

INSTRUCTIONS TO BIDDERS

1. **Basis of Contract.** Contract, if awarded, will be on a lump sum basis and will be substantially in accordance with the Contract Documents dated December 9, 2024.

2. **Examination of Site.** In undertaking the work under this Contract, the Contractor acknowledges that he has visited the Project Site and has taken into consideration all observed conditions that might affect his work.

3. **Surety and Insurance Companies.** The Contract provides that the surety and insurance companies must be acceptable to the Owner. Only those sureties listed in the Department of Treasury's Listing of Approved Sureties (Department Circular 570) are acceptable to the Owner. At the time of issuance, all insurance and bonds must be issued by a company licensed by the Georgia Insurance Commissioner to transact the business of insurance in the State of Georgia for the applicable line of insurance. Such company shall be an insurer (or, for qualified self insurers or group self insureds, a specific excess insurer providing statutory limits) with an A.M. Best Financial Strength Rating of "A-" or better and with an A.M. Best Financial Size Category of Class V or larger.

4. **Bidding Documents.** The Bidding Documents comprise the Construction Documents, the Invitation to Bid, the Instructions to Bidders, the Bid Form, and all Addenda, upon which the bidder submits a bid.

5. **Addenda.** All Addenda issued prior to bid date adjust, modify, or change the drawings and specifications as set forth in the Addenda. No Addenda will be issued within 72 hours of the date set for opening bids without an extension of the bid date. All such Addenda are part of the contract.

6. **Interpretations.** No oral interpretation will be made to bidders as to the meaning of the drawings and specifications. Requests for interpretation of drawings and specifications must be made in writing to the Design Professional not later than six days prior to the date set for receipt of the bids. Failure on the part of the successful bidder to request clarification shall not relieve him as Contractor of the obligation to execute such work in accordance with a later interpretation by the Design Professional. All interpretations made to bidders will be issued in the form of Addenda to the plans and specifications and will be sent to all plan holders of record. Acknowledgement of receipt of such Addenda shall be listed in the Bid Form by the Contractor.

7. **Alternates.** Unless otherwise stipulated, all alternate bids are deductive. It is in the best interest of the public, and the intent of the Owner is, that the entire Project be constructed within the funds allocated in the Project budget. The acceptance of any deductive alternate will be utilized as a last resort to accomplish the Project without requiring a redesign and rebidding of the Project. Any alternate, or alternates, if taken, will be taken in numerical sequence to the extent necessary.

8. **Sales Tax.** Unless otherwise provided for in the Contract Documents, the Contractor shall include in his bid all sales taxes, consumer taxes, use taxes, and all other applicable taxes that are legally in effect at the time bids are received.

9. **Trade Names, Specifications.**

(a) *No Restriction of Competition.* When reference is made in the Contract Documents to trade names, brand names, or to the names of manufacturers, such references are made solely to indicate that products of that description may be furnished and are not intended to restrict competitive bidding. If it is desired to use products of trade or brand names or of manufacturers' names that are different from those mentioned in the Bidding Documents, application for the approval of the use of such products must reach the hands of the Design Professional at least ten days prior to the date set for the opening of bids (*see* 9(b) below). This provision applies only to the party making a submittal prior to bid. If approved by Design Professional, the Design Professional will issue an addendum to all bidders. This provision does not prevent the Owner from initiating the addition of trade names, brand names, or names of manufacturers by addendum prior to bid.

(b) *Request for Approval of Substitute Product*. All requests for approval of substitution of a product that is not listed in the Bidding Documents must be made to the Design Professional in writing. For the Design Professional to prepare an addendum properly, an application for approval of a substitute product must be accompanied by a copy of the published recommendations of the manufacturer for the installation of the product together with a complete schedule of changes in the drawings and specifications, if any, that must be made in other work in order to permit the use and installation of the proposed product in accordance with the recommendations of the manufacturer of the product. The application to the Design Professional for approval of a proposed substitute product must be accompa-

nied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bidding Documents.

(c) *Burden of Proof.* The burden of proving acceptability of a proposed product rests on the party making the submission. Therefore, the application for approval must be accompanied by technical data that the party requesting approval desires to submit in support of its application. The Design Professional will consider reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users, evidence of reputation of the manufacturer for prompt delivery, evidence of reputation of the manufacturer for efficiency in servicing its products, or any other written information that is helpful in the circumstances. The degree of proof required for approval of a proposed product as acceptable for use in place of a named product or named products is that amount of proof necessary to convince a reasonable person beyond all doubt. To be approved, a proposed product must also meet or exceed all express requirements of the Contract Documents.

(d) *Issuance of Addenda.* If the Design Professional approves the submittal, an addendum will be issued to all prospective bidders indicating the approval of the additional product(s). Issuance of an addendum is a representation to all bidders that the Design Professional in the exercise of his professional discretion established that the product submitted for approval is acceptable and meets or exceeds all express requirements. If a submittal is initially rejected by the Design Professional, but determined to be acceptable to Design Professional after a conference with the Owner, an addendum covering the said submittal will be issued prior to the opening of bids. The successful bidder may furnish no products of any trade names, brand names, or manufacturers' names except those designated in the Contract Documents unless approvals have been published by addendum in accordance with the above procedure. Oral approvals of products are not valid.

(e) *Conference with the Owner*. Any party who alleges that rejection of a submittal is the result of bias, prejudice, caprice, or error on the part of the Design Professional may request a conference with a representative of the Owner, provided: that the request for said conference, submitted in writing, shall have reached the Owner at least six days prior to the date set for the opening of bids, time being of the essence.

10. **Employment of Georgia Citizens and Use of Georgia Products.** The work provided for in this Contract is to be performed in Georgia. It is the desire of the Owner that materials and equipment manufactured or produced in Georgia shall be used in the work and that Georgia citizens shall be employed in the work at wages consistent with those being paid in the general area in which the work is to be performed. This desire on the part of the Owner is not intended to restrict or limit competitive bidding or to increase the cost of the work; nor shall the fulfillment of this desire be asserted by the Contractor as an excuse for any noncompliance or omission to fulfill any obligation under the contract.

11. **Trading with the State Statutes, Ethics.** By submitting a bid, the bidder certifies that the provisions of law contained in O.C.G.A. Sections 45-10-20 to 45-10-71, which prohibit officials and employees of the state from engaging in certain transactions with the state and state agencies, and the Governor's Executive Orders governing ethics, have not and will not be violated in any respect in regard to this contract and further certifies that registration and all disclosures required thereby have been complied with.

12. **Georgia Security and Immigration Compliance Act Requirements.** No bid will be considered unless the Contractor certifies its compliance with the Immigration reform and Control Act of 1986 (IRCA), D.L. 99-603 and the Georgia Security Immigration Compliance Act OCGA 13-10-91 *et seq.* The Contractor shall execute the Georgia Security and Immigration Compliance Act Affidavit, as found in Section 7 of the Construction Contract. Contractor also agrees that it will execute any affidavits required by the rules and regulations issued by the Georgia Department of Audits and Accounts. If the Contractor is the successful bidder, contractor warrants that it will include a similar provision in all written agreements with any subcontractors engaged to perform services under the Contract.

14. **Bids.**

(a) *Bid Opening.* Bids will be opened and announced as stated in the Invitation to Bid.

(b) *Bid Submission.* All bids must be submitted on the Bid Form as attached hereto and must be signed, notarized, and sealed by a notary public. All blanks for information entry in bid forms submitted to Owner should be filled. Blanks left unfilled constitute irregularities in the bid and place the bidder at risk of having the bid rejected *unless* the Owner rules the irregularity to be an informality or technicality that the director can waive, as is made clear in Paragraph 16 of these "Instructions to Bidders" and on the Bid Form. Numbers shall be written in English words and in Arabic numerals. **The inclusion of any condition, alternate, qualification, limitation, or provision not called for shall render the bid nonresponsive and shall be sufficient cause for rejection of a bid.**

(c) *Bid Security.* Bids must be accompanied by a Bid Bond made payable to the Owner in an amount not less than five percent of the Bid. Bid Bonds should be furnished on forms accepted as standard by the insurance industry, but shall be substantially in accordance with the Bid Security Form attached hereto.

(d) *Delivery of Bids.* Bids are to be addressed to the Owner, at the address and room number shown in the Invitation to Bid. Bids must be enclosed in an opaque, sealed envelope; marked with the Bid Date, Bid Time, Bid Number, Name of Project; and identified with the words "Bid for Construction." Bids must be placed in the hands of the Owner at the specified location by not later than the hour and date named in the Invitation to Bid. After that time, no bids may be received. It is the sole responsibility of the bidder to ensure the delivery of the bids to the required address.

(e) *Withdrawal of Bids.* Bids may be withdrawn by bidders prior to the time set for official opening. After time has been called, no bid may be withdrawn for a period of thirty-five days after the time and date of opening except as provided in O.C.G.A Section 13-10-22 (appreciable error in calculation of bid). Negligence or error on the part of any bidder in preparing his bid confers no right of withdrawal or modification of his bid after time has been called except as provided by Georgia law.

15. **Contract Award.** Award shall be made on a lump sum basis to the lowest responsive and responsible bidder. The lowest bid will be the bid whose price, after incorporating all accepted alternates, is the lowest responsive bid that was received from a responsible bidder. No bid may be withdrawn for a period of thirty-five days after time has been called on the date of opening except in accordance with the provisions of law.

16. **Owner's Rights Concerning Award.** The Owner reserves the right in its sole and complete discretion to waive technicalities and informalities. The Owner further reserves the right in its sole and complete discretion to reject all bids and any bid that is not responsive or that is over the budget, as amended. In judging whether the bidder is responsible, the Owner will consider, but is not limited to consideration of, the following:

(a) Whether the bidder or its principals are currently ineligible, debarred, suspended, or otherwise excluded from bidding or contracting by any state or federal agency, department, or authority;

(b) Whether the bidder or its principals have been terminated for cause or are currently in default on a public works contract;

(c) Whether the bidder can demonstrate sufficient cash flow to undertake the project as evidenced by a Current Ratio of 1.0 or higher;

(d) Whether the bidder can demonstrate a commitment to safety with regard to Workers' Compensation by having an Experience Modification Rate (EMR) over the past three years not having exceeded an average of 1.2; and

(e) Whether the bidder's past work provides evidence of an ability to successfully complete public works projects within the established time, quality, or cost, or to comply with the bidder's contract obligations.

17. **Owner's Right to Negotiate with the Lowest Bidder.** In the event *all* responsive and responsible bids are in excess of the budget, the Owner, in its sole and absolute discretion and in addition to the rights set forth above, reserves the right either to (i) supplement the budget with additional funds to permit award to the lowest responsive and responsible bid, or (ii) to negotiate with the lowest responsive and responsible bidder (after taking all deductive alternates) only for the purpose of making changes to the Project that will result in a cost to the Owner that is within the budget, as it may be amended.

18. **Contract Forms.** The contract forms, including the payment and performance bonds, shall be as set forth following the bid form – Forms.

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BID REQUIREMENTS

BID FORM

To: **City of Snellville**

Re: **Briscoe Park Community Recreation Center, AATL230037**

Bid Date: **January 28, 2025 @ 2:00 p.m.**

THE BID:

Bid. Having carefully examined the Specifications entitled T.W. Briscoe Park Community and Recreation Center, and the Bidding Documents and Addendum (a) No.(s), _____, as well as the Site and conditions affecting the Work, bidder hereby proposes to furnish all services, labor, materials, and equipment called for by them for the entire Work, in accordance with the aforesaid documents, for the sum of:

_____ Dollars ($ _____)

which sum is hereinafter called the Bid. The Bid shall be the amount of the Contract Sum executed between the Owner and the Contractor unless Alternates are accepted.

Errors or Revisions. Prior to the bid opening date and hour, errors may be stricken or revisions may be made and corrections entered on this proposal form or on the bid envelope with sufficient clarity to be easily understood. All such annotations shall be binding on the bidder.

No Withdrawal. For and in consideration of the sum of $10.00, the receipt of which is hereby acknowledged, bidder and Owner agree that this bid may not be revoked or withdrawn after the time set for the opening of bids, except as provided in Georgia law, but is an irrevocable offer that shall remain open for acceptance for a period of thirty-five days following the time set for the opening of bids.

Execution of the Contract. If bidder is notified in writing by statutory mail of the acceptance of this bid within thirty-five days after time set for the opening of bids, bidder agrees to execute within ten days the Contract for the Work for the above stated Bid, as adjusted by the accepted Alternates, and at the same time to furnish and deliver to the Owner a Performance Bond and a Payment Bond on forms shown in Section 7 of the General Conditions of the Contract, both in an amount of equal to 100 percent of the Contract Sum.

Commencement and Completion of Work. Upon the Effective Date of the Contract, bidder agrees to commence all Preconstruction Activities. Upon issuance of a Proceed Order, bidder agrees to commence physical activities on the Site with adequate forces and equipment and to complete to Material Completion all work in **365** consecutive calendar days beginning the day after the date of the Proceed Order.

Bid Bond. Enclosed herewith is a Bid Bond *(NO OTHER FORM ACCEPTABLE)* in the amount of _____ Dollars ($ _____) (being not less than five percent of the Bid). Bidder agrees that the above stated amount is the proper measure of liquidated damages that the Owner will sustain by bidder's failure to execute the Contract or to furnish the Performance and Payment Bonds should bidder's bid be accepted.

Obligation of Bid Bond. If this bid is accepted within thirty-five days after the date set for the opening of bids and bidder fails to execute the Contract within ten days after Notice of Successful Bid, or if bidder fails to furnish both Performance and Payment Bonds, the obligation of the Bid Bond will remain in full force and effect and the money payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure; otherwise, the obligations of the Bid Bond will be null and void.

Bidder Certification

Certification under Oath. Under oath I certify that I am a principal or other representative of the bidder, and that I am authorized by it to execute the foregoing bid on its behalf; and further, that I am a principal person of the bidder with management responsibility for the construction for the bidder, and as such I am personally knowledgeable of all its pertinent matters. I further certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same services, materials, labor, supplies, or equipment and is in all respects fair and without collusion or fraud. Bidder and its principals understand that collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards. Bidder agrees to abide by all conditions of this bid.

BY: _____
Authorized *Signature* *(BLUE INK)*

_____
Printed Name Title

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

_____
Notary Public

My commission expires: _____

(SEAL)

NOTE: THE NOTARY SEAL MUST BE APPLIED UNDER GEORGIA LAW, WHETHER OR NOT THE LAW OF THE STATE WHERE EXECUTED PERMITS OTHERWISE.

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END OF DOCUMENT 002113

Forms

BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT _____

(Name of Contractor) _____
(Address of Contractor) at

_____

(Corporation, Partnership and or Individual) hereinafter called Principal, and _____

_____
(Name of Surety)

_____
(Address of Surety

A corporation of the State of_____, and a surety authorized by law to do business in the State of Georgia, hereinafter called Surety, are held and firmly bound unto

City of Snellville, Georgia
2342 Oak Road
Snellville, Georgia 30078

herein after referred to as Obligee, in the penal sum of_____Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to submit, or has submitted, to the City of Snellville, Georgia, a proposal for furnishing materials, labor and equipment for:

Invitation to Bid
T.W. Briscoe Park Community
and Recreation Center

WHEREAS, the Principal desires to file this Bond in accordance with law in lieu of a certified Bidder's check otherwise required to accompany this Proposal.

NOW, THEREFORE, the conditions of this obligation are such that if the bid is accepted, the Principal shall within ten days after receipt of notification of the acceptance execute a Contract in accordance with the Bid and upon the terms, conditions, and prices set forth in the form and manner required by the City of Snellville, Georgia, and execute a sufficient and satisfactory Performance Bond and Payment Bond payable to the City of Snellville, Georgia, each in an amount of 100% of the total Contract Price, in form and with security satisfactory to said the City of Snellville, Georgia, and otherwise, to be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the City of Snellville,

Georgia, upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

PROVIDED, FURTHER, that Principal and Surety agree and represent that this bond is executed pursuant, to and in accordance with the applicable provisions of the Official Code of Georgia Annotated, as Amended, including, but not limited to, O.C.G.A. SS 13-10-1, et. Seg. And SS 36-86-101, et. Seg. And is intended to be and shall be constructed as a bond in compliance with the requirements thereof.

Signed, sealed, and dated this_____day of_____A.D., 20___

ATTEST:

_____ _____

(Principal Secretary) (Principal)

(SEAL) BY: _____

_____ _____

(Witness to Principal) (Address)

_____

(Address)

_____

(Surety)

ATTEST

BY: _____

(Attorney-in-Fact) and Resident Agent

_____

(Attorney-in-Fact)

(Seal) _____

(Address)

_____

(Witness as to Surety)

_____

(Address)

_____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: THAT

_____
(Name of Contractor)

_____
(Address of Contractor)

_____
(Corporation, Partnership or Individual)

_____
Hereinafter called Principal, and

_____
(Name of Surety)

_____
(Address of Surety)

A Corporation of the State of_____and a surety authorized by law to do business in the State of Georgia, hereinafter called Surety, are held and firmly bound unto:

The City of Snellville Georgia

_____
(Name of Obligee)

City of Snellville, 2342 Oak Road, Snellville, Georgia 30078

_____
(Address of Obligee)

Hereinafter referred to as Obligee; for the use and protection of all subcontractors and all persons supplying labor, services, skill, tools, machinery, materials and/or equipment in the prosecution of the work provided for in the contract hereinafter referred to in the full and just sum of _____Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, the Principal and Surety bind themselves, their, and each of their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The condition of this obligation is such, as whereas the Principal entered into a certain contract, hereto attached, with the Obligee, dated_____ for_____.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall well, truly, and faithfully perform said Contract in accordance to its terms, covenants, and conditions, and shall promptly pay all persons furnishing labor, materials, services, skill, tools, machinery and/or equipment for use in the performance of said Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect.

All persons who have furnished labor, materials, services, skill, tools, machinery and/or equipment for use in the performance of said Contract shall have a direct right of action on this Bond, provided payment has not been made in full within ninety (90) days after the last day on which labor was performed, materials service, skill, tools, machinery, and equipment furnished or the subcontract completed.

PROVIDED FURTHER, that said Surety to this Bond, for value received, hereby stipulates and agrees that no change, extension of time, alterations, or additions, to the terms of the Contract or to the Work to be performed thereunder shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations, or additions to the terms of the Contract or to the work to be performed there under.

PROVIDED, HOWEVER, that no suit or action shall be commenced hereunder by any person furnishing labor, materials, services, skill, tools, machinery, and /or equipment having a direct contractual relationship with a subcontractor, but no contractual relationship express or implied with the Principal:

Unless such person shall have given notice to the Principal within 120 days after such person did, or performed the last of the work or labor, or furnished the last of the materials, services, skill, tools, machinery and/or equipment for which claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials, services, skill, tools, machinery, and/or equipment were furnished, or for whom they work or labor was done or performed. Such a notice shall be served by mailing the same by registered mail, postage prepaid, in an envelope addressed to the Principal, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the State in which the aforesaid project is located, save that such service need not be made by a public officer, and a copy of such notice shall be delivered to the Obligee, to the person and at the address provided for in the Contract, within five days of the mailing of the notice to the Principal.

PROVIDED FURTHER, that any suit under this Bond must be instituted before the expiration of one year after the acceptance of the public works covered by the Contract by the proper authorities.

PROVIDED FURTHER, that Principal and Surety agree and represent that this bond is executed pursuant to and in accordance with the applicable provision of the Official Code of Georgia Annotated, as amended, including, but not limited to, O.C.G.A. SS 13-10-1, et. Eq. and SS 36-86-101, et. Seg., and is intended to be and shall be construed as a bond in compliance with the requirements, therefore.

Signed, sealed, and dated this_____day of_____, 2024
ATTEST:

_____ _____
(Principal Secretary) (Principal)
(Seal)

By:_____

_____ _____
(Witness to Principal) (Address)

_____ (Surety)

ATTEST BY:

_____ _____
Agent

_____
(Attorney-in-Fact)

(Seal)

_____
(Address)

_____
(Witness as to Surety)

PERFORMANCE

BOND

KNOW ALL MEN BY THESE PRESENTS: THAT

_____

(Name of Contractor)

_____

(Address of Contractor)

_____

(Corporation, Partnership or Individual)

_____

Hereinafter called Principal, and

_____

(Name of Surety)

_____

(Address of Surety)

A Corporation of the State of_____and a surety authorized by law to do business in the State of Georgia, hereinafter called Surety, are held and firmly bound unto:

The City of Snellville, Georgia

_____

(Name of Obligee)

City of Snellville, 2342 Oak Road, Snellville, GA. 30078

_____

(Address of Obligee)

Hereinafter referred to as Obligee; are held firmly bound unto said Obligee and all persons doing work or furnishing skill, tools, machinery, supplies, or material under or for the purpose of the Contract hereinafter referred to, in the penal sum of:_____Dollars ($_____), in lawful money of United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

The condition of this obligation is such, as whereas the Principal entered into a certain contract, hereto attached, with the Obligee, dated_____for:_____.

NOW THEREFORE, the conditions of this obligation are such that if the above-bound Principal shall well, truly, fully and faithfully perform said contract according to its terms, covenants, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the oblige, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreement of any and all duly authorized modifications of said contract that may hereafter be made, then his obligation shall be void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that said Surety to this Bond, for value received, hereby stipulates and agrees that no change, extension of time, alterations, or additions to the terms of the Contract or to the Work to be performed there under shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations, or additions to the terms of the Contract or to the work to be performed there under.

PROVIDED FURTHER, that Principal and Surety agree and represent that this bond is executed pursuant to and in accordance with the applicable provisions of the Official Code of Georgia Annotated, as amended, including but not limited t. O. C.G.A. SS 13-10-1 et. Eq. and SS 36-86-101, et Seg., and is intended to be and shall be construed as a bond in compliance with the requirements thereof.

Signed, sealed, and dated this_____day of_____, 2024
ATTEST:

_____
(Principal)

_____
(Principal Secretary)

(Seal)

By: _____

_____
(Witness to Principal)

_____
(Address)

_____
(Surety)

ATTEST:

_____
(Attorney-in-Fact) and Resident Agent

_____
(Attorney-in-Fact)

(Seal)

_____
(Address)

_____
(Witness as to Surety)

_____
(Address)

Affidavit Pursuant to Georgia Immigration Laws

Note: As a prerequisite to certain interactions with local government, Georgia Law requires an affidavit regarding the subjects indicated herein.

1. I am over the age of 18, of sound mind, and am competent to make this Affidavit.

2. Initial all that apply (you may initial more than one):

_____ I execute this Affidavit as an applicant for a Public Benefit. Public Benefits include Retirement Benefits, Health Benefits, Disability Benefits, Contracts, Business Loans, Business Licenses, Professional Licenses, Certificates authorizing the transaction of regulated businesses, and/or other benefits as referenced and defined in O.C.G.A. Section 50-36-1, and as defined by the Attorney General of the State of Georgia.

_____ I execute this Affidavit as an applicant for a business license in the City of Snellville, Georgia.

_____ I execute this Affidavit as a contractor or subcontractor on a project of the City of Snellville, Georgia or one of its departments.

3. I submit this affidavit on behalf of _____ (self or business entity).

4. With respect to my personal presence in the United States, I state as follows:

a. _____ I am a United States citizen. **OR**

b. _____ I am a legal permanent resident 18 years of age or older or I am an otherwise qualified alien or non-immigrant under the Federal Immigration and Nationality Act lawfully present in the United States. I have provided my Alien Registration Number or, in the event I do not have an Alien Registration Number, I have provided another identifying number below.*

5. *(For Business Licenses, Contractors, and Subcontractors Only)* With respect to efforts to verify the lawful presence of persons employed or engaged by me or the entity on behalf of which I sign this Affidavit, I affirm (a) that the system known as "E-Verify" is used to determine immigration status of all employees, contractors or subcontractors, as the case may be; (b) that the pertinent E-Verify user number is _____; (c) that E-Verify will be used to verify the immigration status of all employees and contractors/subcontractors in the future, indefinitely; and (d) that I will notify the City of Snellville immediately if there should be any change in the above stated E-Verify usage.**

6. In making the above representations under oath, I understand that the City of Snellville and its employees are relying upon this affidavit, and I hereby authorize them to do so. I am aware that any person who knowingly and willfully makes a false, fictitious, or fraudulent statement or representation in an affidavit shall be guilty of a violation of Code Section 16-10-20 of the Official Code of Georgia.

Signature of Applicant: Date:

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

_____ _____

_____ DAY OF _____, 20___. Print: _____

_____
Alien Reg. No. or Other Identifying No. for Non-Citizens

_____
Notary Public
My Commission Expires:_____

* **Note:** O.C.G.A. § 50-36- l(e)(2) requires that aliens under the federal Immigration and Nationality Act, as amended, provide their alien registration number. Because legal permanent residents are included in the federal definition of "alien", legal permanent residents must also provide their alien registration number. **Qualified aliens that do not have an alien registration number may supply another identifying number.** ** **Note:** For those persons filling out this Affidavit only for a business license, the applicable dates for the requirement to use E-Verify are as follows: (a) employers of 500 or more employees must use E-Verify by January 1, 2012; (b) employers of 100 to 500 employees must use E-Verify by July 1, 2012; (c) employers of 10 to 100 employees must use E-Verify by July 1, 2013.

OFFICE USE ONLY: Type of Secure and Verifiable Document: _____; Business License Number:_____

DRUG-FREE WORKPLACE

The undersigned certifies that the provisions of Code Sections 50-24-1 through 50-24-6 of the Official Code of Georgia Annotated, relating to the "Drug-free Workplace Act", have been complied with in full. The undersigned further certifies that:

(1) A drug-free workplace will be provided for the Contractor's employees during the performance of the Contract with the City of Snellville; and

(2) Each Contractor who hires a subcontractor to work in a drug-free workplace shall secure from the subcontractor the following written certification:
"As part of the subcontracting agreement with_____(Contractor),
_____(subcontractor) certifies to the Contractor that a drug-free workplace will be provided for the subcontractor's employees during the performance of this Contract pursuant to paragraph (7) of the subsection (b) of Code Section 50-24-03."

Also, the undersigned further certifies that he/she will not engage in the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana during the performance of the Contract.

_____

Company Name

_____

BY: Authorized Officer or Agent Date
(Contractor Signature)

_____

Title of Authorized Officer or Agent of Contractor

_____

Printed Name of Authorized Officer or Agent

NON-COLLUSION AFFIDAVIT
T.W. BRISCOE PARK COMMUNITY AND RECREATION CENTER

For Project:_____

Bid Date:_____

State of _____)

County of _____)

_____ being first duly sworn, deposes and says that:

(1) Signer is the [*Owner, Partner, Officer, Representative or Agent*] (circle one) of _____ _____, the Bidder that has submitted the attached Bid.

(2) Signer is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this signer, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Bidder, firm, or person to submit a collusive or sham Bid in connection with the Work for which the attached Bid has been submitted; or to refrain from bidding in connection with such Work; or have in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference with any Bidder, firm, or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit, or cost elements of the Bid price or to fix any overhead, profit, or cost elements 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 City of Snellville, or any person interested in the proposed Work;

(5) 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 other of its agents, representatives, owners, employees or parties in interests, including this affidavit.

Subscribed and sworn to before me

BY: _____
(Signature)

_____

this _____ day of _____, 20_____.

_____
(Title)

My commission expires _____.

Subcontractor Affidavit and Agreement:

SUBCONTRACTOR AFFIDAVIT AND AGREEMENT

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services under a contract with _____ (insert name of contractor) on behalf of the City of Snellville has registered with and is participating in a federal work authorization program* [any of the electronic verification or work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

_____
EEV / Basic Pilot Program* User Identification Number

_____
Subcontractor Name

_____ _____
BY: Authorized Officer or Agent Date

_____
Title of Authorized Officer or Agent of Contractor

_____
Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE

_____ DAY OF _____, 20_____

_____
Notary Public
My Commission Expires:

_____

* As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

(End of Form)

GWINNETT COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
HOUSING AND COMMUNITY DEVELOPMENT
446 West Crogan Street, Suite 420 | Lawrenceville, GA 30046
678.518.6008
GwinnettPnD.com

TO: Prospective Bidders

FROM: CDBG Program Analyst

DATE: November 27, 2023

SUBJECT: Community Development Block Grant Program Certifications

The following CDBG Grant Certifications apply to your proposal or bid. Please complete the required information and submit with your proposal or bid.

If you have any questions, please contact:

Gwinnett County Housing and Community Development
One Justice Square, 446 West Crogan Street, Suite 420
Lawrenceville, GA 30046-2439
Telephone: 678-518-6008
Email: cdbg@gwinnettcounty.com

CDBG Certifications Applicable To This Proposal or Bid:

In accordance with the Housing and Community Development Act of 1974 [hereinafter referred to as "The Act"], as amended, and Community Development Block Grant Program regulations [24 CFR Part 570] and Consolidated Plan regulations [25 CFR Part 91], the Contractor certifies that:

(a) Regulation Compliance – The Scope of Work for this CDBG funded project/activity will be conducted and administered in compliance with:

1. Title VI of the Civil Rights Act of 1964 (Public Law 88-352, 42 U.S.C. §2000d et sec.);
2. The Fair Housing Act (42 U.S.C. 3601-20); and
3. Section 3 of the Housing and Urban Development Act of 1968 and implementing regulations at 24 CFR Part 135.

(b) Anti-Lobbying – To the best of its knowledge and belief:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an

employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, it will complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions; and

3. Consultant will require that the language of paragraph 1 and 2 of this anti-lobbying certification be included in the contract documents for all sub-consultants at all tiers and that all sub-consultants shall certify and disclose accordingly.

(c) Drug Free Workplace – Consultant/Contractor will or will continue to provide a drug-free workplace by:

1. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor's and Subcontractor's workplaces and specifying the actions that will be taken against employees for violation of such prohibition;

2. Establishing an ongoing drug-free awareness program to inform employees about -

   (a) The dangers of drug abuse in the workplace;

   (b) Policy for maintaining a drug-free workplace;

   (c) Any available drug counseling, rehabilitation, and employee assistance programs; and

   (d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

3. Making it a requirement that each employee to be engaged in the performance of the contract be given a copy of the statement required by paragraph 1;

4. Notifying the employee in the statement required by paragraph 1 that, as a condition of employment under the contract, the employee will -

   (a) Abide by the terms of the statement; and

   (b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

5. Notifying the Grantee (Gwinnett County) in writing, within ten calendar days after receiving notice under subparagraph 4(b) from an employee or otherwise receiving

actual notice of such conviction. Employers of convicted employees must provide notice, including name and position title, to the Grantee's (Gwinnett County) officer or other designee on whose contract activity the convicted employee was working. Notice shall include the identification of each affected Contract;

6. Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph 4(b), with respect to any employee who is so convicted –

   (a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

   (b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

7. Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs 1, 2, 3, 4, 5 and 6.

8. The Contractor must insert in the space provided below the site(s) for the performance of work done in connection with the specific project/activity:

Place of Performance (Street address, city, county, state, zip code)

Check 0 if there are workplaces on file that are not identified here; and

(d) Contractor will comply with the provisions of the Act and with other applicable laws.

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

EQUAL OPPORTUNITY PROVISION CERTIFICATIONS
[EXECUTIVE ORDER 11246]
EQUAL OPPORTUNITY PROVISIONS:

A. Executive Order 11246 (Contractors/Subcontracts above $10,000)

1. Section 2012 Equal Opportunity Clause:

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. 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 apprenticeships. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to provided setting forth provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration without regard to race, color, religion, sex or national origin.

(3) The Contractor will send to each labor union or representative or workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the Contract Compliance Officer advising the said labor union or workers' representatives of the Contractor's commitment under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the Department and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and others.

(6) In the event of the contractor's non-compliance with the non-discrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor

issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions, including sanctions for non-compliance. Provide however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Department the Contractor may request the United State to enter into such litigation to protect the interest of the United States.

SPECIAL EQUAL OPPORTUNITY PROVISIONS:

A. Activities and Contracts Not Subject to Executive Order 11246, as Amended

(Applicable to Federally assisted construction contracts and related subcontracts $10,000 and under)

During the performance of this contractor, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. 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 apprenticeships.

(2) The Contractor shall post in conspicuous places, available to employees and other applicants for employment, notices to be provided by Contracting Officer set forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) Contractors shall incorporate foregoing requirements in all subcontracts.

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

INSTRUCTIONS

This certification is required pursuant to Executive order 11246 (30F.R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the Equal Opportunity Clause; and, if so, whether it has completed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

CERTIFICATION BY BIDDER

Name and Full Address of Bidder _____

1. Has the Bidder participated in a previous contract or subcontract subject to the Equal Opportunity Clause?

   ☐ Yes ☐ No

2. Were Compliance Reports required in connection with such contract(s) or subcontract(s)?

   ☐ Yes ☐ No

3. Has the Bidder completed all compliance instructions, including the SF-100?

   ☐ Yes ☐ No ☐ None Required

4. Have you ever been or are you being considered for sanction(s) due to a violation of Executive Order 11246, as amended?

   ☐ Yes ☐ No

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION BY PROPOSED SUBCONTRACTOR
REGARDING EQUAL EMPLOYMENT OPPORTUNITY

_____

Name of Prime Contractor Project Number

INSTRUCTIONS

This certification is required pursuant to Executive order 11246 (30F.R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the Equal Opportunity Clause; and, if so, whether it has completed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

SUBCONTRACTOR'S CERTIFICATION

Name and Full Address of Subcontractor

1. Has the Subcontractor participated in a previous contract or subcontract subject to the Equal Opportunity Clause?

☐ Yes ☐ No

2. Where Compliance Reports required in connection with such contract(s) or subcontract(s)?

☐ Yes ☐ No

3. Has the Subcontractor completed all compliance instructions, including the SF-100?

☐ Yes ☐ No ☐ None Required

4. Have you ever been or are you being considered for sanction(s) due to a violation of Executive Order 11246, as amended?

☐ Yes ☐ No

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

CERTIFICATION OF NONSEGREGATED FACILITIES

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
CERTIFICATION OF NONSEGREGATED FACILITIES

INSTRUCTIONS

The bidder certifies that he/she does not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location, under his/her control, where segregated facilities are maintained. The bidder certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, any location under his/her control where segregated facilities are maintained. The bidder agrees that a breach of his/her certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term “segregated facilities” means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The bidder agrees that (except where he/she has obtained identical certification from proposed subcontractors specific time periods) he/she will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause, and that he/she will retain such certifications in his/her files.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

CERTIFICATION BY BIDDER

_____
Name and Full Address of Bidder

_____
Name of Company

_____
Name and Title of Authorized Certifying Official

_____
Signature of Authorized Certifying Official Signature Date

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
CERTIFICATION OF NONSEGREGATED FACILITIES

INSTRUCTIONS

The subcontractor certifies that he/she does not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location, under his/her control, where segregated facilities are maintained. The subcontractor certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, any location under his/her control where segregated facilities are maintained. The subcontractor agrees that a breach of his/her certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term “segregated facilities” means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The subcontractor agrees that (except where he/she has obtained identical certification from proposed subcontractors specific time periods) he/she will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity Clause, and that he/she will retain such certifications in his/her files.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

SUBCONTRACTOR’S CERTIFICATION

_____
Name and Full Address of Subcontractor

_____
Name of Company

_____
Name and Title of Authorized Certifying Official

_____
Signature of Authorized Certifying Official Signature Date

Certification Regarding Debarment and Suspension

U.S. Department of Housing and Urban Development

Certification A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief that its principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal debarment or agency;

b. Have not within a three-year period preceding this proposal, been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification, or destruction of records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

d. Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Instructions for Certification (A)

1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was place when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms **covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded**, as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of these regulations.

6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines this eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph (6) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

Certification B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Instructions for Certification (B)

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms **covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded**, as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of these regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph (5) of these instructions, if a participant in a lower covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies including suspension and/or debarment.

Applicant | Date

Signature of Authorized Certifying Official | Title of Authorized Certifying Official

SECTION 3 PLAN

SECTION 3 CLAUSE OF THE URBAN DEVELOPMENT ACT OF 1968 [135.38 SECTION 3 CLAUSE]

SECTION 3 PLAN

All Section 3 covered contracts shall include the following clause (referred to as the Section 3 clause):

A. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

G. With respect to work performed in connection with Section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises, Parties to this contract that are subject to the provisions of Section 3 and section 7(b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

SECTION 3 PLAN FORMAT

_____ (**Name of Consulting Firm/Contractor)**, Agrees to implement the following specific Section 3 Plan directed at increasing the utilization of lower income residents and businesses within Gwinnett County.

A. To ascertain from Gwinnett County Housing and Community Development the exact boundaries of the Section 3 covered project area. And, where advantageous, seek the assistance of local officials in preparing and implementing the Firm's Section 3 Plan.

B. To recruit from within the Project Area and Gwinnett County the necessary number of lower income residents through: local advertising media, signs placed at the proposed site for the project, and through community organizations and public or private institutions operating within or serving the project area and Gwinnett County such as the Chamber of Commerce, the Georgia Department of Labor, the JTPA Program, the Urban League, the NAACP, the Local Housing Authorities, and related organizations. The firm will provide Gwinnett County with details on the specific actions which were taken to recruit within the project service area, and within Gwinnett County.

C. To obtain a list of all lower income area residents who have applied, either on their own or by referral from any source, and to employ such persons, if otherwise eligible, and if a vacancy exists. The firm will submit a list of the residents identified, the sources from which these names were obtained, and any on-going actions which will be made to obtain such lists of eligible Section 3 residents once the Consulting Firm, and all subcontractors, initiate any hiring actions.

D. To insert the Section 3 Plan in all bid proposal documents, and to require all bidders on subcontracts to submit a Section 3 Plan, including numeric goals and the specific steps planned to accomplish these goals.

E. To formally contact unions, subcontractors, and trade associations to secure their cooperation for this program. The firm will identify all contacts made, dates for each, and the agreements obtained from each person/agency contacted.

F. To insure that all appropriate Section 3 business concerns are notified of pending subcontract opportunities. The firm will detail how the Consulting Firm and subcontractors, will meet the Section 3 contract numeric goals (See TABLE B "Goals" attached), or explain in detail why the numeric goals cannot be met.

G. To maintain records (Monthly Section 3 Report), including copies of correspondence, memoranda, etc., which document that all of the above action steps have been taken. Any documents which demonstrate that the Consulting Firm will be successful in meeting its overall goals will be incorporated in the Section 3 Plan which is submitted as a part of the Consulting Firm's bid proposal.

H. To appoint or recruit an executive official of the Consulting Firm, _____, as Section 3 Officer to coordinate the implementation of this Section 3 plan.

I. To attach Table A – Work Force Needs, on which will be listed all projected work force needs for all phases of this project, by occupation, trade, skill level and number of positions, along with the number of new hires anticipated for this project, and the number of Section 3 residents for which jobs will be made available.

J. To prepare a detailed Section 3 Plan which addresses, at a minimum, all of the items contained herein. The Consulting Firm is encouraged to provide any other details, and specific information which explains how the firm will meet, or exceed, the numeric goals for Section 3 -- Employment and Contractual.

[SIGNATURES ON NEXT PAGE]

SECTION 3 PLAN – SIGNATURE PAGE

As officers and representative of _____ **(Name of Consulting Firm/Contractor)**, we the undersigned have read and fully agree to this Section 3 Plan and become a party to the full implementation of this program.

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

_____

Name and Title of Additional Signatory

_____

Signature of Additional Signatory Signature Date

SECTION 3 PLAN – TABLE A

WORK FORCE NEEDS

Name of Company

Please list all projected Work Force needs for all phases of the subject project, by trade, skill level and number of positions. Also, please note the number of positions which will be hired during the project period and note those positions which will be filled through eligible Section 3 residents.

Project Name

Type of Occupations/Trade/Skill Level	**Number of Positions for Each Skill Level**	**Number of New Positions to be Hired**	**Number of New Positions To Be Filled with Section 3 Residents**

SECTION 3 PLAN – TABLE B

GOALS

A. Section 3 Residents - New Hires

Numerical Goals for Resident Employment

For all Section 3 covered contracts [$100,000 or more], Consulting Firms, and their subcontractors, may demonstrate compliance by committing to employ Section 3 residents as a percentage of the aggregate new hires for each year over the duration of the Section 3 project. The 30 percent of the aggregate number of new hires constitute a safe harbor for Consulting Firms and subcontractors:

Each Consulting Firm, or Subcontractor, must meet the following employment hiring preferences in order to comply with this Section.

(1) Section 3 residents who reside in the project service area, neighborhood, or within Gwinnett County. The CDBG Program Office should be contacted regarding the priorities, herein.
(2) Participants in any HUD Youthbuild Programs within Gwinnett County - if this Program becomes available.
(3) Other Section 3 residents, such as public housing, Section 8, JTPA or other very low- and low-income residents within Gwinnett County.
(4) If McKinney Homeless Assistance Act funds [i.e., ESG Program or other McKinney Funds received by Gwinnett County] are used on a covered Section 3 project, then homeless persons residing in the project service area must be given the highest priority.

B. Section 3 Business Concerns

Numerical Goals For Contracting

For all Section 3 contracts, Consulting Firm and their subcontractors may demonstrate compliance by committing to award to Section 3 business concerns:

(1) At least 10 percent of the total dollar amount of all Section 3 covered contracts for "building trades work", arising in connection with housing rehabilitation, housing construction and other public construction; and
(2) At least three (3) percent of the total dollar amount of all other Section 3 covered contracts, i.e., management, clerical, professional services.
(3) Section 3 Business Concern: A Section 3 Business Concern is defined as a company that meets one or more of the following criteria:
(a) 51% of the business is owned by Section 3 residents.
(b) 30% of the employees are Section 3 residents.
(c) 25% of the total subcontracts are awarded to other businesses that meet 3 (a) or (b).

C. Definitions

Section 3 Residents - (1) A public housing resident, or (2) an individual who resides in Gwinnett County and is a low-income person, or very low-income person. Low-income person is defined as to mean families (including single persons) whose incomes do not exceed 80 per centum of the median income for the Metropolitan Atlanta area. A very Low- income person is defined as to mean families (including single persons) whose incomes do not exceed 50 per centum of the median income for the Metropolitan Atlanta area.

Section 3 Business Concerns - means a business concern that is (1) 51 percent or more owned by Section 3 residents; or (2) whose permanent, full - time employees include persons, at least 30 percent of whom are currently Section 3 residents, or within three years of the date of first employment with the business concern were Section 3 residents; or (3) that provides evidence of a commitment to subcontract in excess of 25 percent of the dollar award of all subcontracts to be awarded to business concerns that meet the qualifications set forth in (1) and (2) of this definition.

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION OF BIDDER REGARDING SECTION 3 AND NONSEGRAGATED FACILITIES

The undersigned hereby certifies that

(a) Section 3 provisions are included in the Contract; and

(b) No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

CERTIFICATION BY BIDDER

Name and Full Address of Bidder

Name of Company

Name and Title of Authorized Certifying Official

Signature of Authorized Certifying Official Signature Date

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION OF BIDDER REGARDING SECTION 3 AND NONSEGRAGATED FACILITIES

The undersigned hereby certifies that

(a) Section 3 provisions are included in the Contract; and

(b) No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

SUBCONTRACTOR'S CERTIFICATION

Name and Full Address of Subcontractor

Name of Company

Name and Title of Authorized Certifying Official

Signature of Authorized Certifying Official Signature Date

CERTIFICATION OF CONCERNING LABOR STANDARDS

AND PREVAILING WAGE REQUIREMENTS

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION OF BIDDER CONCERNING LABOR STANDARDS AND PREVAILING WAGE REQUIREMENTS

Name of Project | Project Number (if applicable)

The undersigned, having executed a contract for the construction of the above-identified project, acknowledges that:

(a) The Labor Standards provisions are included in the aforesaid contract; and

(b) Correction of any infractions of the aforesaid conditions, including infractions by any of his subcontracts and any lower tier subcontractors, is his responsibility.

The undersigned certifies that:

(a) Neither he nor any firm, partnership, or association in which he has substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6 (b) of the regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5) or pursuant to Section 5(a) of the Davis-Bacon Act, as amended (40 U.S.C. 276a-2(a));

(b) No part of the aforementioned contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation, partnership, or association in which such subcontractor has a substantial interest in designated as an ineligible contractor pursuant to any of the aforementioned regulatory or statutory provisions; and

(c) He agrees to obtain and forward to the aforementioned recipient within ten days after the execution of any subcontract, including those executed by his subcontractors and any lower tier subcontractors, a Subcontractor's Certification Concerning Labor Standards and Prevailing Wage Requirements executed by the subcontractors.

CONTRACTOR'S CERTIFICATION

Legal Name and Business Address of Contractor:

The undersigned is:

☐ A Single Proprietorship ☐ A Corporation Organized in the State of _____

☐ A Partnership ☐ Other Organization – Describe _____

[Certification Continues on the Next Page]

CONTRACTOR'S CERTIFICATION (continued)

The name, title and address of the owner, partner or officers of the undersigned are:

Name	Title	Address

The names and addresses of all other persons, both natural and corporate, having a substantial interest in the undersigned, and the nature of the interest are (If none, so state):

Name	Title	Address

The names, addresses and trade classifications or all other building construction contractors in which the undersigned has a substantial interest are (If none, so state):

Name	Title	Address

Name of Company

Name and Title of Authorized Certifying Official

Signature of Authorized Certifying Official Signature Date

WARNING

U.S. Criminal Code, Section 1010, Title 18, U.S.C., provides in part: "Whoever,... makes, passes, utters or publishes any statement, knowing the same to be false... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION OF BIDDER CONCERNING LABOR STANDARDS AND PREVAILING WAGE REQUIREMENTS

Name of Project | Project Number (if applicable)

The undersigned, having executed a contract for the construction of the above-identified project, acknowledges that:

(a) The Labor Standards provisions are included in the aforesaid contract; and

(b) Correction of any infractions of the aforesaid conditions, including infractions by any of his subcontracts and any lower tier subcontractors, is his responsibility.

The undersigned certifies that:

(a) Neither he nor any firm, partnership, or association in which he has substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6 (b) of the regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5) or pursuant to Section 5(a) of the Davis-Bacon Act, as amended (40 U.S.C. 276a-2(a));

(b) No part of the aforementioned contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation, partnership, or association in which such subcontractor has a substantial interest in designated as an ineligible contractor pursuant to any of the aforementioned regulatory or statutory provisions; and

(c) He agrees to obtain and forward to the aforementioned recipient within ten days after the execution of any subcontract, including those executed by his subcontractors and any lower tier subcontractors, a Subcontractor's Certification Concerning Labor Standards and Prevailing Wage Requirements executed by the subcontractors.

SUBCONTRACTOR'S CERTIFICATION

Legal Name and Business Address of Contractor:

The undersigned is:

☐ A Single Proprietorship ☐ A Corporation Organized in the State of _____

☐ A Partnership ☐ Other Organization – Describe _____

[Certification Continues on the Next Page]

SUBCONTRACTOR'S CERTIFICATION (continued)

The name, title and address of the owner, partner or officers of the undersigned are:

Name	Title	Address

The names and addresses of all other persons, both natural and corporate, having a substantial interest in the undersigned, and the nature of the interest are (If none, so state):

Name	Title	Address

The names, addresses and trade classifications or all other building construction contractors in which the undersigned has a substantial interest are (If none, so state):

Name	Title	Address

Name of Company

Name and Title of Authorized Certifying Official

Signature of Authorized Certifying Official Signature Date

WARNING

U.S. Criminal Code, Section 1010, Title 18, U.S.C., provides in part: "Whoever,... makes, passes, utters or publishes any statement, knowing the same to be false... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

CERTIFICATION OF CONCERNING THE BUILD AMERICA, BUY AMERICA ACT (BABA)

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION OF BIDDER REGARDING THE BUILD AMERICA, BUY AMERICA ACT (BABA)

The Grantee must comply with the requirements of the Build America, Buy America (BABA) Act, 41 USC 8301 note, and all applicable rules and notices, as may be amended, if applicable to the Grantee's infrastructure project. Pursuant to HUD's Notice, "Public Interest Phased Implementation Waiver for FY 2022 and 2023 of Build America, Buy America Provisions as Applied to Recipients of HUD Federal Financial Assistance" (88 FR 17001), any funds obligated by HUD on or after the applicable listed effective dates, are subject to BABA requirements, unless excepted by a waiver.

The Build America, Buy America Act (BABA) was signed into law by President Biden on November 15, 2021, as part of the Infrastructure Investment and Jobs Act (IIJA) as Sections 70901- 52 of Pub. L. No. 117-58. In addition to providing funding for roads, bridges, rails, and high-speed internet access, it created an incentive to increase domestic manufacturing across the country through the inclusion of BABA's "Buy America Preference" (BAP). In general, the BAP requires that all iron, steel, manufactured products, and construction materials used in infrastructure projects funded with Federal financial assistance (FFA), as outlined in Section 70914(a) of BABA, must be produced in the United States. The intent of the BAP in BABA is to stimulate private-sector investments in domestic manufacturing, bolster critical supply chains, and support the creation of well-paying jobs for people in the United States. The preference is also intended to bolster American firms' ability to compete and lead globally for years to come by requiring entities that receive Federal infrastructure funds to use American materials and products.

_____

Name and Full Address of Bidder

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

SUBCONTRACTOR'S CERTIFICATION REGARDING THE BUILD AMERICA, BUY AMERICA ACT (BABA)

The Grantee must comply with the requirements of the Build America, Buy America (BABA) Act, 41 USC 8301 note, and all applicable rules and notices, as may be amended, if applicable to the Grantee's infrastructure project. Pursuant to HUD's Notice, "Public Interest Phased Implementation Waiver for FY 2022 and 2023 of Build America, Buy America Provisions as Applied to Recipients of HUD Federal Financial Assistance" (88 FR 17001), any funds obligated by HUD on or after the applicable listed effective dates, are subject to BABA requirements, unless excepted by a waiver.

The Build America, Buy America Act (BABA) was signed into law by President Biden on November 15, 2021, as part of the Infrastructure Investment and Jobs Act (IIJA) as Sections 70901- 52 of Pub. L. No. 117-58. In addition to providing funding for roads, bridges, rails, and high-speed internet access, it created an incentive to increase domestic manufacturing across the country through the inclusion of BABA's "Buy America Preference" (BAP). In general, the BAP requires that all iron, steel, manufactured products, and construction materials used in infrastructure projects funded with Federal financial assistance (FFA), as outlined in Section 70914(a) of BABA, must be produced in the United States. The intent of the BAP in BABA is to stimulate private-sector investments in domestic manufacturing, bolster critical supply chains, and support the creation of well-paying jobs for people in the United States. The preference is also intended to bolster American firms' ability to compete and lead globally for years to come by requiring entities that receive Federal infrastructure funds to use American materials and products.

_____

Name and Full Address of Subcontractor

_____

Name of Company

_____

Name and Title of Authorized Certifying Official

_____

Signature of Authorized Certifying Official Signature Date

APPENDIX TO CDBG CERTIFICATIONS

APPENDIX 1

INSTRUCTIONS CONCERNING LOBBYING AND DRUG-FREE WORKPLACE REQUIREMENTS

A. Lobbying Certification – Paragraph n

This certification is a material representation of the fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

B. Drug-Free Workplace Certification – Paragraph o

1. By signing and/or submitting this application or grant agreement, the contractor is providing the certification set out in paragraph (o).

2. The certification set out in paragraph (o) is a material representation of fact upon which reliance is placed when the agency awards the grant. If it is later determined that the grantee knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, HUD, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

3. For contractors other than individuals, Alternate I applies. (This is the information to which entitlement grantees certify).

4. For contractors who are individuals, Alternate II applies. (Not applicable to CDBG entitlement grantees).

5. Workplaces under grants, for grantees other than individuals, need not be identified on the certification. If know, they may be identified in the grant application. If the grantee does not identify the workplaces at the time of application, or upon award, if there is no application, the grantee must keep the identity of the workplace(s) on file in its office and make the information available for Federal inspection. Failure to identify all known workplaces constitutes a violation of the grantee’s drug-free workplace requirements.

APPENDIX 2

FEDERAL LABOR STANDARDS PROVISIONS
U.S. Department of Housing and Urban Development
Office of Labor Relations

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal Assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics subject to the provisions of 29 CFR 5.5 (a)(1) (iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5 (a) (4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5 (a) (1) (ii) and the Davis-Bacon poster (WH-1321 shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination, and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification within 30 days of receipt and so advise HUD or its designee or within the 30-day period that additional time is necessary. (Approved by the Officer of Management and Budget under OMB control number 1215-0140).

(c) In the event the contractor, the laborers or mechanics is to be employed in the classification or their representative, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for the determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Officer of Management and Budget under OMB control number 1215-0140).

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborers or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside, in a separate account, assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140).

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written

notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom then are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contribution or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section I(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section I(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control number 1215-0140 and 1215-0017.)
(ii)(a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i). This information may be submitted in any form desired. Option Form WH-347 is available for this purpose and may be purchased for the Superintendent of Documents (Federal Stock number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149).
(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
(1) That the payroll for the payroll period contains the information required to be maintained under 29 CFR 5.5 (a)(3)(i) and that such information is correct and complete;
(2) That each laborer or mechanic (including each helper, apprentices, and trainee) employed on the contract during the payroll period has been paid the fully weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for the submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).
(d) The falsification of any of the above certification may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.
(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.
(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to an individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a States Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ration of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ration permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with

that determination. In the event of the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Expect as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 of this paragraph A and such other clauses as HUD or its designee may be appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 FCFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5,6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3 (a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.
(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3 (a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.
(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010 Title 18, U.S.C., "Federal Housing Administration transaction", provides in part: "whoever, for the purpose of…influencing in any way the action of such Administration…makes, utters or publishes any statement knowing the same to be false…shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable only where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he or she is employed on such work to work in excess of 40 hours in such work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violations: liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor, and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such

contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on the account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontractors the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable only where the amount of prime contract exceeds $100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under work conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, 40 USC 3701 et seq.

(3) The Contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontracts as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

APPENDIX 3

Applicable Davis Bacon Wage Rate Decision

APPENDIX 4

Build America, Buy America Act (BABA)

BUILD AMERICA, BUY AMERCIA ACT (BABA)
U.S. Department of Housing and Urban Development
Office of Community Planning and Development

I. Overview of Build America, Buy America Act

The Build America, Buy America Act (BABA)

The Build America, Buy America Act (BABA) was signed into law by President Biden on November 15, 2021, as part of the Infrastructure Investment and Jobs Act (IIJA) as Sections 70901- 52 of Pub. L. No. 117-58. In addition to providing funding for roads, bridges, rails, and high-speed internet access, it created an incentive to increase domestic manufacturing across the country through the inclusion of BABA's "Buy America Preference" (BAP). In general, the BAP requires that all iron, steel, manufactured products, and construction materials used in infrastructure projects funded with Federal financial assistance (FFA), as outlined in Section 70914(a) of BABA, must be produced in the United States. The intent of the BAP in BABA is to stimulate private-sector investments in domestic manufacturing, bolster critical supply chains, and support the creation of well-paying jobs for people in the United States. The preference is also intended to bolster American firms' ability to compete and lead globally for years to come by requiring entities that receive Federal infrastructure funds to use American materials and products. The BABA preference for American materials and products applies to all spending on infrastructure projects by Federal agencies, including HUD. In BABA and for purposes of this Notice, the Federal infrastructure spending with a BAP is referred to as "Federal financial assistance" or "FFA." Under Section 70912(7), FFA for infrastructure "projects" includes the "construction, alteration, maintenance, or repair of infrastructure in the United States". Under Section 70914(a), the use of American iron and steel, construction materials, and manufactured products applies to funding from CPD programs for infrastructure projects. However, the BAP does not apply to "pre and post disaster or emergency response expenditures" under Section 70912(4)(B). A list of CPD disaster or emergency funding meeting these criteria can be found in Section III. Effective May 14, 2022, the BAP applies to infrastructure spending unless an agency issues a waiver in three limited situations: 1) when applying the domestic content procurement preference 3 would be inconsistent with the public interest, 2) when types of iron, steel, manufactured products or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality, or 3) where the inclusion of those products and materials will increase the cost of the overall project by more than 25 percent. Before issuing a waiver, under Section 70914(c), the head of a Federal agency, including HUD, must make publicly available a detailed written explanation for the proposed determination to issue the waiver and provide a period of not less than 15 days for public comment on the proposed waiver. Additional details on waivers can be found in Section IV.

II. Definitions

Key terms that have relevance to the interpretation and implementation of the BAP for CPD programs are defined in the BABA statute and may be found in 2 CFR part 184 and OMB guidance.

A. Build America, Buy America Act is defined in 2 CFR § 184.3 and means division G, title IX, subtitle A, parts I–II, sections 70901 through 70927 of the Infrastructure Investment and Jobs Act (Pub. L. No. 117-58)

B. Buy America Preference is defined in 2 CFR § 184.3 and means the "domestic content procurement preference" set forth in section 70914 of BABA, which requires the head of each Federal agency to ensure that none of the funds made available for a Federal award for an infrastructure project may be obligated unless all of the iron, steel, manufactured products, and construction materials incorporated into the project are produced in the United States.

C. Categorization of Articles. The term "categorization of articles" refers to the requirement that articles, materials, and supplies should only be classified into one of the following categories:

i. Iron or steel products;
ii. Manufactured products;
iii. Construction materials; or
iv. Section 70917(c) materials.

An article, material, or supply should not be classified into more than one category and must be made based on the status of the article, material, or supply upon arrival to the work site for use in an infrastructure project. Articles, materials, or supplies must meet the Buy America Preference for only the single category in which they are classified and, in some cases, may not fall under any of the categories listed above.

D. Component is defined in 2 CFR § 184.3 and means an article, material, or supply, whether manufactured or unmanufactured, incorporated directly into: a manufactured product; or, where applicable, an iron or steel product.

E. Construction Materials is defined in 2 CFR § 184.3 and means articles, materials, or 5 supplies that consist of only one of the items listed in paragraph (1) of this definition, except as provided in paragraph (2) of this definition. To the extent one of the items listed in paragraph (1) contains as inputs other items listed in paragraph (1), it is nonetheless a construction material.

(1) The listed items are:

i. Non-ferrous metals;
ii. Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
iii. Glass (including optic glass);
iv. Fiber optic cable (including drop cable);
v. Optical fiber;
vi. Lumber;
vii. Engineered wood, and
viii. Drywall.

(2) Minor additions of articles, materials, supplies or binding agents to a construction material do not change the categorization of the construction material.

F. Covered Materials includes the following when used in connection with an Infrastructure Project:
   (A) all iron and steel;
   (B) all Manufactured Products; and
   (C) all Construction Materials.

G. Covered CPD Programs. The term "covered CPD programs" means any Federal financial assistance administered by CPD that is used for infrastructure purposes, excepting expenditures related to pre and post disaster or emergency response.

H. Grantee. The term "grantee," as defined at 24 CFR 5.100, means the person or legal entity to which a grant is awarded and that is accountable for the use of the funds provided.

I. Federal Financial Assistance (FFA) has the meaning given to the term in 2 CFR 200.1 (or successor regulations) and includes all expenditures by a Federal agency to a Non-Federal Entity for an Infrastructure Project, except that it does not include:
   (A) expenditures for assistance authorized under section 402, 403, 404, 406, 408, or 502 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5170a, 5170b, 5170c, 5172, 5174, or 5192) relating to a major disaster or emergency declared by the President under section 401 or 501, respectively, of such Act (42 U.S.C. 5170, 5191); or
   (B) pre and post disaster or emergency response expenditures.

J. Infrastructure is described in 2 CFR 184.4(c) and encompasses public infrastructure projects in the United States, which includes, at a minimum: the structures, facilities, and equipment for roads, highways, and bridges; public transportation; dams, ports, harbors, and other 6 maritime facilities; intercity passenger and freight railroads; freight and intermodal facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property; and structures, facilities, and equipment that generate, transport, and distribute energy including electric vehicle (EV) charging. See also 2 CFR 184.4(d).

K. Infrastructure Project. The term "infrastructure project" is defined in 2 CFR 184.3 and means any activity related to the construction, alteration, maintenance, or repair of infrastructure in the United States regardless of whether infrastructure is the primary purpose of the project.

L. Iron and Steel Products. The term "iron and steel products" is defined in 2 CFR 184.3 and means an article, material, or supply that consists wholly or predominantly of iron or steel, or a combination of both.

M. Predominantly of iron or steel or a combination of both is defined in 2 CFR 184.3 and means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components.

N. Made in America Office. The term "Made in America Office" or "MIAO" means the office at the Office of Management and Budget, established by section 70923 of BABA, that is charged with, among other things, enforcing compliance with the BAP and establishing the procedures to review waiver requests proposed by a Federal awarding agency.

O. Manufactured Products is defined in 2 CFR 184.3 and means:
(1) Articles, materials, or supplies that have been:
(i) Processed into a specific form and shape; or
(ii) Combined with other articles, materials, or supplies to create a product with different properties than the individual articles, materials, or supplies.
(2) If an item is classified as an iron or steel product, a construction material, or a section 70917(c) material under 2 CFR 184.4(e) and the definitions set forth in this section, then it is not a manufactured product. However, an article, material, or supply classified as a manufactured product under 2 CFR 184.4(e) and paragraph (1) of this definition may include components that are construction materials, iron or steel products, or section 70917(c) materials.

P. Manufacturer is defined in 2 CFR 184.3 and means the entity that performs the final manufacturing process that produces a manufactured product.

Q. Non-Federal Entity means a State, local government, Indian Tribe, Institution of Higher Education (IHE), or nonprofit organization, as provided in 2 CFR 200.1. Public Housing Agencies are Non-Federal Entities. 7

R. Not Listed Construction Materials. The term "not listed construction materials" refers to the category of construction materials that are subject to the BAP, but not included in HUD's specifically listed construction materials, as defined in the Phased Implementation Waiver.
This includes:
i. plastic and polymer-based products other than composite building materials or plastic and polymer-based pipe or tube;
ii. glass (including optic glass); and
iii. drywall.

S. Obligate. The term "obligate," for purposes of HUD's phased implementation of BABA, means the date that HUD executed the legal instrument creating the relationship between HUD and the grantee for an award of Federal financial assistance. The milestone that establishes an obligation date depends on each

program but for many CPD programs, such as CDBG, the obligation date occurs upon HUD's execution of the grant agreement.

T. OMB Guidance. The term "OMB guidance" refers to 2 CFR Part 184, the "Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure" (M-24-02), issued October 25, 2023, by the Office of Management and Budget, and any subsequent guidance to rescind or replace M-24-02. This guidance is applicable to the heads of all Federal agencies for the implementation of BABA's Buy America Preference.

U. Pre and Post Disaster or Emergency Response Expenditures. The term "pre and post disaster or emergency response expenditures" means Federal funding authorized under section 402, 403, 404, 406, 408, or 502 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) relating to a major disaster or emergency declared by the President under section 401 or 501, respectively. The BAP does not apply to pre- and post-disaster or emergency response expenditures authorized by statutes other than the Stafford Act and made in anticipation of or in response to an event that qualifies as an emergency or major disaster within the meaning of the Stafford Act.

V. Produced in the United States is defined in 2 CFR 184.3 and means:

i. In the case of iron or steel products, all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

ii. In the case of manufactured products:

1. The product was manufactured in the United States; and
2. The cost of components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard that meets or exceeds this standard has been established under applicable law or regulation for determining the minimum amount of domestic content of the manufactured product. See 2 CFR 184.2(a). The costs of components of a manufactured product are determined according 8 to 2 CFR 184.5.

iii. In the case of construction materials, all manufacturing processes for the construction material occurred in the United States. See 2 CFR 184.6 for more information on the meaning of "all manufacturing processes" for specific construction materials.

W. Project. The term "project" means the construction, alteration, maintenance, or repair of infrastructure in the United States. (Section 70912(7) of BABA).

X. Section 70917(c) Materials. The term "section 70917(c) materials" is defined in 2 CFR 184.3 and means cement and cementitious materials; aggregates such as

stone, sand, or gravel, or aggregate binding agents or additives. These materials are not considered “construction materials” for the purpose of BABA implementation.

Y. Specifically listed construction materials. The term “specifically listed construction materials” for HUD programs includes:
   a. non-ferrous metals;
   b. lumber;
   c. composite building materials; and
   d. plastic and polymer-based pipe and tube.

III. Buy America Preference Waivers Currently in Effect for HUD Programs

Under Section 70914(b), HUD is able to issue, after consultation with OMB’s MIAO, general waivers, and project-specific waivers to the BAP if it is determined that a waiver falls into one of the following three categories: 1) when applying the domestic content procurement preference would be inconsistent with the public interest, 2) when types of iron, steel, manufactured product or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality, or 3) where the inclusion of those products and materials will increase the cost of the overall project by more than 25 percent. In order for HUD to consider either a general or project specific waiver request and be able to review it with OMB, the waiver must include a detailed written explanation and allow for the public to comment for at least 15 days, as required under Section 70914(c).

HUD's General Waivers Applicable to Covered CPD Programs

Four general applicability waivers are currently in effect for HUD programs and apply to all Covered CPD Programs. Each waiver is outlined below.

General Waiver Type	Purpose	Effective Dates
Public Interest Phased Implementation	HUD issued a public interest waiver, "Public Interest Phased Implementation Waiver for FY 2022 and 2023 of Build America, Buy America Provisions as Applied to Recipients of HUD Federal Financial Assistance" to allow for orderly implementation of the BAP across HUD programs. The Phased Implementation Waiver establishes a schedule for the phased implementation of the BAP across CPD programs and infrastructure materials.	The public interest waiver was issued in March 2023 and established a phased implementation schedule for the application of the BAP to HUD programs through FY2025. The BAP has been in effect since November 15, 2022, for the use of iron and steel for infrastructure projects funded with newly obligated FFA through the CDBG program.
Exigent Circumstances	HUD issued a public interest waiver for exigent circumstances, "Public Interest Waiver of Build America, Buy America Provisions for Exigent Circumstances as Applied to Certain Recipients of HUD Federal Financial Assistance". This waiver applies when there is an urgent need by a CPD grantee to immediately complete an infrastructure project because of a threat to life, safety, or property of residents and the community.	The public interest waiver for exigent circumstances is effective from November 23, 2022, for a period of five years ending on November 23, 2027, or such shorter time as HUD may announce via Notice.
De Minimis, Small Grants, and Minor Components	HUD issued a public interest de minimis, small grants, and minor components waiver titled "Public Interest De Minimis and Small Grants Waiver of Build America, Buy America Provisions as Applied to Certain Recipients of HUD Federal Financial Assistance". This waives the BAP for all infrastructure projects whose total cost (from all funding sources) is equal to or less than the simplified acquisition threshold at 2 CFR 200.1 which is currently $250,000. This Notice also waives the application of the BAP for a de minimis portion of an infrastructure project, meaning a cumulative total of no more than five percent of the total cost of the iron, steel, manufactured products, and construction materials used in and incorporated into the infrastructure project, up to a maximum of $1 million.	The public interest de minimis, small grants, and minor components waiver is effective from November 23, 2022, for a period of five years ending on November 23, 2027, or such shorter time as HUD may announce via Notice.
Tribal Recipients Waiver	HUD issued a public interest waiver, "Extension of Public Interest, General Applicability Waiver of Build America, Buy America Provisions as Applied to Tribal Recipients of HUD Federal Financial Assistance: Final Notice" for the BAP as it applies to Tribal recipients. HUD will consult with Tribally Designated Housing Entities and other Tribal Entities on how to apply the BAP.	

HUD Project-Specific Waivers

Additionally, a CPD grantee may request a project-specific waiver from the BAP for covered FFA on a limited, case-by-case basis. HUD may grant a project specific waiver after consultation and review with the OMB's MIAO. As with the general waivers, under Section 70914(b) HUD may issue a project-specific waiver to the BAP if it is determined that a waiver falls into one of the following three categories: 1) when applying the domestic content procurement preference would be inconsistent with the public interest, 2) when types of iron, steel, manufactured product or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality, or 3) where the inclusion of those products and materials will increase the cost of the overall project by more than 25 percent. A waiver for a specific project may vary depending upon the circumstances of the project, and specific items, products, or materials in question.

"General Decision Number: GA20240308 09/20/2024

Superseded General Decision Number: GA20230308

State: Georgia

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories)

County: Gwinnett County in Georgia.

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

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2024
1	03/22/2024
2	09/20/2024

ASBE0048-003 04/05/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 28.09	17.19

CARP1263-001 10/01/2023

	Rates	Fringes
MILLWRIGHT	$ 31.58	17.05

ELEC0613-004 09/02/2023

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring)	$ 34.50	32%

ELEC0613-005 09/02/2023

	Rates	Fringes
ELECTRICIAN (Low Voltage Wiring)	$ 34.50	32%

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* ENGI0926-004 07/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
Backhoe/Excavator/Trackhoe	$ 28.00	12.03

ENGI0926-005 07/01/2022

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
Crane	$ 34.66	13.83

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* ENGI0926-006 08/01/2024

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
Forklift	$ 31.65	15.03

IRON0387-002 01/01/2024

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 30.24	14.81
IRONWORKER, STRUCTURAL	$ 30.24	14.81

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* PLUM0072-003 08/01/2024

	Rates	Fringes
PIPEFITTER		

(Excluding HVAC Pipe and Unit Installation)	$ 39.13	13.31
(HVAC Pipe Installation Only)	$ 31.68	13.31
(HVAC Unit Installation Only)	$ 39.13	13.31
PLUMBER	$ 39.13	13.31

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* SHEE0085-022 07/01/2024

	Rates	Fringes
SHEET METAL WORKER (Excludes HVAC Duct Installation)	$ 34.58	16.49
SHEET METAL WORKER (HVAC Duct Installation Only)	$ 35.21	17.72

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* UAVG-GA-0001 01/01/2024

	Rates	Fringes
IRONWORKER, REINFORCING	$ 30.08	17.12

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* SUGA2017-023 04/15/2021

	Rates	Fringes
CARPENTER (Form Work Only)	$ 18.02	0.00
CARPENTER, Excludes Form Work	$ 21.06	3.54
CEMENT MASON/CONCRETE FINISHER	$ 10.00 **	0.00
GLAZIER	$ 21.77	6.36
INSTALLER - GUARDRAIL	$ 20.00	0.00
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 15.69 **	0.00
LABORER: Common or General	$ 15.00 **	0.00
LABORER: Pipelayer	$ 12.55 **	1.90
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 20.24	0.00
OPERATOR: Bulldozer	$ 15.23 **	0.00
OPERATOR: Grader/Blade	$ 16.80 **	0.00
OPERATOR: Loader	$ 21.32	0.00
OPERATOR: Roller	$ 16.82 **	1.19
PAINTER (Brush and Roller)	$ 16.14 **	0.00
PAINTER: Spray	$ 16.29 **	0.00

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.20) or 13658 ($12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

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

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

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

Union Rate Identifiers

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

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing

this classification and rate.

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

State Adopted Rate Identifiers

Classifications listed under the ""SA"" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R ?1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

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

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

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

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

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

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

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

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

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

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

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END OF GENERAL DECISION"

DOCUMENT 004322

UNIT PRICES FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Prime Contract:

C. Project Name: T.W. Briscoe Park Community & Recreation Center.

D. Project Location: 2500 Sawyer Pkwy SW, Snellville, GA 30078.

E. Owner: City of Snellville

F. Owner Project Number:

G. Architect: Goodwyn Mills Cawood, LLC.

H. Architect Project Number: AATL230037.

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. The undersigned Bidder proposes the amounts below be added to or deducted from the Contract Sum on performance and measurement of the individual items of Work.

C. If the unit price does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."

1.3 UNIT PRICES

A. Unit-Price No. 1: Mass Earth Excavation.

1. _____ dollars ($_____) per unit.

B. Unit-Price No. 2: Trench Earth Excavation.

1. _____ dollars ($_____) per unit.

C. Unit-Price No. 3: Hand Earth Excavation.

1. _____ dollars ($_____) per unit.

D. Unit-Price No. 4: Additional Soil.
   1. Item No. 4a - Topsoil
      a. _____ dollars ($_____) per unit.
   2. Item No. 4b – General of Open Site Areas
      a. _____ dollars ($_____) per unit.
   3. Item No. 4c – Trench Backfill
      a. _____ dollars ($_____) per unit.
   4. Item No. 4d – Off-site Select Fill:
      a. _____ dollars ($_____) per unit.

E. Unit-Price No. 5: Concrete Mud Footings.

   1. _____ dollars ($_____) per unit.

F. Unit-Price No. 6 – Undercut & Backfill in Building Control Areas.

   1. _____ dollars ($_____) per unit.

G. Unit-Price No. 7 – Undercut & Backfill in Non-Building Control Areas.

   1. _____ dollars ($_____) per unit.

H. Unit-Price No. 8 – Graded Aggregate.

   1. _____ dollars ($_____) per unit.

1.4 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this ____ day of _____, 2024.

B. Submitted By:_____(Insert name of bidding firm or corporation).

C. Authorized Signature:_____(Handwritten signature).

D. Signed By:_____(Type or print name).

E. Title:_____(Owner/Partner/President/Vice President).

END OF DOCUMENT 004322

SECTION 006000

PROJECT FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
   1. Owner's document(s) bound following this Document.
      a. CONTRACT AGREEMENT (CITY OF SNELLVILLE. Added at end of section)
      b. GENERAL CONDITIONS (CITY OF SNELLVILLE . Added at end of section)

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; www.aiacontractdocsaiacontracts.org; (800) 942-7732.

C. Preconstruction Forms:

   1. Form of Performance Bond and Labor and Material Bond: AIA Document A312-2010 "Performance Bond and Payment Bond."
   2. Form of Certificate of Insurance: AIA Document G715-2017 "Supplemental Attachment for ACORD Certificate of Insurance 25."

D. Payment Forms:

   1. Schedule of Values Form: AIA Document G703-1992 "Continuation Sheet."
   2. Payment Application: AIA Document G702-1992/703-1992 "Application and Certificate for Payment and Continuation Sheet."

END OF SECTION 006000

CONTRACT AGREEMENT

This Agreement made and entered into on the _____ day of _____, 2025 by and between the City of Snellville, Georgia, party of the first part (hereinafter called the "Owner"), and _____, party of the second part, (hereinafter called the "Contractor"),

WITNESSETH:

That the Contractor, for the consideration hereinafter fully set out hereby agrees with the Owner as follows:

1. That the Contractor will furnish all products, tools, construction equipment, skill, and labor of every description necessary to carry out and to complete the T.W. BRISCOE PARK COMMUNITY AND RECREATION CENTER PROJECT in a good, firm, substantial and workmanlike manner the construction of but is not limited to the following major items:

    1. Construction of a 34,276 square foot multi-level community and recreation center.
    2. Site work that will include a new parking area and supporting utilities.

2. The term "CONTRACT DOCUMENTS" means and includes the following:

    1. Advertisement for Bids
    2. Instructions to Bidders
    3. Bid Proposal
    4. Contract Agreement
    5. Notice of Award
    6. Notice to Proceed
    7. Performance Bond
    8. Payment Bond
    9. General Conditions
    10. Contractor E-Verify Affidavit
    11. Subcontractor E-Verify Affidavit
    12. Drug-Free Workplace
    13. Non-Collusion Affidavit
    14. Community Development Block Grant Certifications

ADDENDA

NO.	DATE:
_____	_____
_____	_____
_____	_____
_____	_____

3. The following drawings are part of this contract:

    Briscoe Park Construction Documents
    Project Manual for Snellville Briscoe Park Community Recreaion Center

4. That the Contractor shall commence the work to be performed under this Agreement on a date to be specified in a written Notice to Proceed and shall fully complete all work within three hundred sixty-five (365) consecutive calendar days. Time is of the essence and is an essential element of this Contract, and the Contractor shall pay to the Owner, not as a penalty, but as liquidated damages, the sum of One Thousand Dollars ($1,000) for each working day that he shall be in default of completing the work within the time limit named herein. The Owner shall consider extensions to the Contract Time only if a formal request for extension is submitted in writing with back-up information, and the extension is due to circumstances beyond the Contractor’s control. If the

Contractor abandons the Contract before commencement of the work or defaults in completion of all the work after commencement thereof, the Contractor shall be liable for such liquidated damages. These fixed liquidated damages are not established as a penalty but are calculated and agreed upon in advance by the Owner and the Contractor due to the uncertainty and impossibility of making a determination as to the actual and consequential damages incurred by the Owner and the general public of the City of Snellville, Georgia, as a result of the failure on the part of the Contractor to complete the work on time. Such liquidated damages referred to herein are intended to be and are cumulative and shall be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute, or under the Contract.

5. The Owner hereby agrees to pay to the Contractor for the faithful performance of this Agreement, subject to additions and deductions as provided in the Specifications and Proposal, in lawful money of the United States the sum of _____Dollars ($_____) which sum shall also pay for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from unforeseen obstructions or difficulties encountered in the execution of the work, and for all expenses incurred by, or in consequence of the work, its suspension or discontinuance, and for well and faithfully completing the work and the whole thereof, as herein provided, and for replacing defective work or products for a period of one year after completion.

6. The Owner shall make monthly partial payments to the Contractor in accordance with the provisions of the Contract Documents.

7. Contractor shall perform all the work for this project, in accordance with the provisions of the Contract Documents.

8. This contract is conditioned on both parties' compliance with the requirements of O.C.G.A. § 13-10-91. The City of Snellville employs 100 or more employees, and is in compliance with O.G.C.A. § 13-10-91. Contractor hereby states that it has complied with the requirements of O.G.C.A. § 13-10-91, as attested to by the attached affidavit, and will obtain the employee-number category and eligibility verification from all subcontracts it uses regarding this project.

9. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the surety bonds hereto attached for its faithful performance, the Owner shall deem the sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the work, the Contractor shall, at his expense, within five (5) days after the receipt of notice from the Owner to do so, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Owner. In such event, no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Owner.

10. Disputes arising out of this contract shall be heard in the superior courts of Gwinnett County, Georgia. The Owner and Contractor agree that jurisdiction and venue are proper in the superior courts of Gwinnett County, Georgia, exclusively, and they hereby waive any defenses they may have to improper venue, lack of jurisdiction over their person, and lack of subject matter jurisdiction.

11. This agreement constitutes the entire agreement between the parties and supercedes all prior agreements or understandings between the parties.

12. In case any one or more of the provisions contained in this agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, the invalidity, illegality or unenforceablility shall not affect the other provisons, and the remaining provisions of this agreement shall be given full effect.

13. The Contractor agrees to indemnify Owner and hold Owner and its agents and employees harmless from and against all actions, causes of action, suits, liabilities, claims, damages, losses, costs and expenses (including attorney's fees and costs) arising out of or resulting from (a) any act or omission of Contractor in the performance or non-performance of the Work or its obligations hereunder, (b) any breach of contract by Contractor, and (c) any claim for injury to person or property arising out of, or in the course of, the Work as

contemplated by this Contract. The parties hereto agree that the terms of this Paragraph 5 shall survive any termination or expiration of the Contract.

In any and all claims against the Owner, or any of their agents or employees, by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefits acts.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement under their respective seals on the day and date first above written in two (2) counterparts, each of which shall without proof or accounting for the other counterparts, be deemed an original Contract.

CITY OF SNELLVILLE, GEORGIA

By: _____

Name: _____

Title: _____Seal

Attest: _____

Name: _____

Title:

_____

Approved As to Form Before Execution:

By: _____
Attorney for the Owner

Name:_____

CONTRACTOR:

By:_____

Name: _____

Title: _____Seal

Attest: _____

Name: _____

Title: _____

Signed and Sealed in the presence of:

By: _____
Notary Public

NOTE: If the Contractor is a corporation, the Agreement shall be signed by the President or Vice President, attested by the Secretary and the corporate seal affixed. If the Contractor is a partnership, the Agreement shall be signed in the partnership name by one of the partners, with indication that he is a general partner.

CONTRACT AGREEMENT

This Agreement made and entered into on the _____ day of _____, 2025 by and between the City of Snellville, Georgia, party of the first part (hereinafter called the "Owner"), and _____, party of the second part, (hereinafter called the "Contractor"),

WITNESSETH:

That the Contractor, for the consideration hereinafter fully set out hereby agrees with the Owner as follows:

1. That the Contractor will furnish all products, tools, construction equipment, skill, and labor of every description necessary to carry out and to complete the T.W. BRISCOE PARK COMMUNITY AND RECREATION CENTER PROJECT in a good, firm, substantial and workmanlike manner the construction of but is not limited to the following major items:

    1. Construction of a 34,276 square foot multi-level community and recreation center.
    2. Site work that will include a new parking area and supporting utilities.

2. The term "CONTRACT DOCUMENTS" means and includes the following:

    1. Advertisement for Bids
    2. Instructions to Bidders
    3. Bid Proposal
    4. Contract Agreement
    5. Notice of Award
    6. Notice to Proceed
    7. Performance Bond
    8. Payment Bond
    9. General Conditions
    10. Contractor E-Verify Affidavit
    11. Subcontractor E-Verify Affidavit
    12. Drug-Free Workplace
    13. Non-Collusion Affidavit
    14. Community Development Block Grant Certifications

ADDENDA

NO.	DATE:
_____	_____
_____	_____
_____	_____
_____	_____

3. The following drawings are part of this contract:

    Briscoe Park Construction Documents
    Project Manual for Snellville Briscoe Park Community Recreaion Center

4. That the Contractor shall commence the work to be performed under this Agreement on a date to be specified in a written Notice to Proceed and shall fully complete all work within three hundred sixty-five (365) consecutive calendar days. Time is of the essence and is an essential element of this Contract, and the Contractor shall pay to the Owner, not as a penalty, but as liquidated damages, the sum of One Thousand Dollars ($1,000) for each working day that he shall be in default of completing the work within the time limit named herein. The Owner shall consider extensions to the Contract Time only if a formal request for extension is submitted in writing with back-up information, and the extension is due to circumstances beyond the Contractor’s control. If the

Contractor abandons the Contract before commencement of the work or defaults in completion of all the work after commencement thereof, the Contractor shall be liable for such liquidated damages. These fixed liquidated damages are not established as a penalty but are calculated and agreed upon in advance by the Owner and the Contractor due to the uncertainty and impossibility of making a determination as to the actual and consequential damages incurred by the Owner and the general public of the City of Snellville, Georgia, as a result of the failure on the part of the Contractor to complete the work on time. Such liquidated damages referred to herein are intended to be and are cumulative and shall be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute, or under the Contract.

5. The Owner hereby agrees to pay to the Contractor for the faithful performance of this Agreement, subject to additions and deductions as provided in the Specifications and Proposal, in lawful money of the United States the sum of _____Dollars ($_____) which sum shall also pay for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from unforeseen obstructions or difficulties encountered in the execution of the work, and for all expenses incurred by, or in consequence of the work, its suspension or discontinuance, and for well and faithfully completing the work and the whole thereof, as herein provided, and for replacing defective work or products for a period of one year after completion.

6. The Owner shall make monthly partial payments to the Contractor in accordance with the provisions of the Contract Documents.

7. Contractor shall perform all the work for this project, in accordance with the provisions of the Contract Documents.

8. This contract is conditioned on both parties' compliance with the requirements of O.C.G.A. § 13-10-91. The City of Snellville employs 100 or more employees, and is in compliance with O.G.C.A. § 13-10-91. Contractor hereby states that it has complied with the requirements of O.G.C.A. § 13-10-91, as attested to by the attached affidavit, and will obtain the employee-number category and eligibility verification from all subcontracts it uses regarding this project.

9. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the surety bonds hereto attached for its faithful performance, the Owner shall deem the sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the work, the Contractor shall, at his expense, within five (5) days after the receipt of notice from the Owner to do so, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Owner. In such event, no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Owner.

10. Disputes arising out of this contract shall be heard in the superior courts of Gwinnett County, Georgia. The Owner and Contractor agree that jurisdiction and venue are proper in the superior courts of Gwinnett County, Georgia, exclusively, and they hereby waive any defenses they may have to improper venue, lack of jurisdiction over their person, and lack of subject matter jurisdiction.

11. This agreement constitutes the entire agreement between the parties and supercedes all prior agreements or understandings between the parties.

12. In case any one or more of the provisions contained in this agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, the invalidity, illegality or unenforceablility shall not affect the other provisons, and the remaining provisions of this agreement shall be given full effect.

13. The Contractor agrees to indemnify Owner and hold Owner and its agents and employees harmless from and against all actions, causes of action, suits, liabilities, claims, damages, losses, costs and expenses (including attorney's fees and costs) arising out of or resulting from (a) any act or omission of Contractor in the performance or non-performance of the Work or its obligations hereunder, (b) any breach of contract by Contractor, and (c) any claim for injury to person or property arising out of, or in the course of, the Work as

contemplated by this Contract. The parties hereto agree that the terms of this Paragraph 5 shall survive any termination or expiration of the Contract.

In any and all claims against the Owner, or any of their agents or employees, by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefits acts.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement under their respective seals on the day and date first above written in two (2) counterparts, each of which shall without proof or accounting for the other counterparts, be deemed an original Contract.

CITY OF SNELLVILLE, GEORGIA

By: _____

Name: _____

Title: _____Seal

Attest: _____

Name: _____

Title:

_____

Approved As to Form Before Execution:

By: _____
Attorney for the Owner

Name:_____

CONTRACTOR:

By:_____

Name: _____

Title: _____Seal

Attest: _____

Name: _____

Title: _____

Signed and Sealed in the presence of:

By: _____
Notary Public

NOTE: If the Contractor is a corporation, the Agreement shall be signed by the President or Vice President, attested by the Secretary and the corporate seal affixed. If the Contractor is a partnership, the Agreement shall be signed in the partnership name by one of the partners, with indication that he is a general partner.

SECTION 006000

PROJECT FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
   1. Owner's document(s) bound following this Document.
      a. CONTRACT AGREEMENT (CITY OF SNELLVILLE. Added at end of section)
      b. GENERAL CONDITIONS (CITY OF SNELLVILLE . Added at end of section)

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; www.aiacontractdocsaiacontracts.org; (800) 942-7732.

C. Preconstruction Forms:

   1. Form of Performance Bond and Labor and Material Bond: AIA Document A312-2010 "Performance Bond and Payment Bond."
   2. Form of Certificate of Insurance: AIA Document G715-2017 "Supplemental Attachment for ACORD Certificate of Insurance 25."

D. Payment Forms:

   1. Schedule of Values Form: AIA Document G703-1992 "Continuation Sheet."
   2. Payment Application: AIA Document G702-1992/703-1992 "Application and Certificate for Payment and Continuation Sheet."

END OF SECTION 006000

CONTRACT AGREEMENT

This Agreement made and entered into on the _____ day of _____, 2025 by and between the City of Snellville, Georgia, party of the first part (hereinafter called the "Owner"), and _____, party of the second part, (hereinafter called the "Contractor"),

WITNESSETH:

That the Contractor, for the consideration hereinafter fully set out hereby agrees with the Owner as follows:

1. That the Contractor will furnish all products, tools, construction equipment, skill, and labor of every description necessary to carry out and to complete the T.W. BRISCOE PARK COMMUNITY AND RECREATION CENTER PROJECT in a good, firm, substantial and workmanlike manner the construction of but is not limited to the following major items:

    1. Construction of a 34,276 square foot multi-level community and recreation center.
    2. Site work that will include a new parking area and supporting utilities.

2. The term "CONTRACT DOCUMENTS" means and includes the following:

    1. Advertisement for Bids
    2. Instructions to Bidders
    3. Bid Proposal
    4. Contract Agreement
    5. Notice of Award
    6. Notice to Proceed
    7. Performance Bond
    8. Payment Bond
    9. General Conditions
    10. Contractor E-Verify Affidavit
    11. Subcontractor E-Verify Affidavit
    12. Drug-Free Workplace
    13. Non-Collusion Affidavit
    14. Community Development Block Grant Certifications

ADDENDA

NO.	DATE:
_____	_____
_____	_____
_____	_____
_____	_____

3. The following drawings are part of this contract:

    Briscoe Park Construction Documents
    Project Manual for Snellville Briscoe Park Community Recreaion Center

4. That the Contractor shall commence the work to be performed under this Agreement on a date to be specified in a written Notice to Proceed and shall fully complete all work within three hundred sixty-five (365) consecutive calendar days. Time is of the essence and is an essential element of this Contract, and the Contractor shall pay to the Owner, not as a penalty, but as liquidated damages, the sum of One Thousand Dollars ($1,000) for each working day that he shall be in default of completing the work within the time limit named herein. The Owner shall consider extensions to the Contract Time only if a formal request for extension is submitted in writing with back-up information, and the extension is due to circumstances beyond the Contractor’s control. If the

Contractor abandons the Contract before commencement of the work or defaults in completion of all the work after commencement thereof, the Contractor shall be liable for such liquidated damages. These fixed liquidated damages are not established as a penalty but are calculated and agreed upon in advance by the Owner and the Contractor due to the uncertainty and impossibility of making a determination as to the actual and consequential damages incurred by the Owner and the general public of the City of Snellville, Georgia, as a result of the failure on the part of the Contractor to complete the work on time. Such liquidated damages referred to herein are intended to be and are cumulative and shall be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute, or under the Contract.

5. The Owner hereby agrees to pay to the Contractor for the faithful performance of this Agreement, subject to additions and deductions as provided in the Specifications and Proposal, in lawful money of the United States the sum of _____Dollars ($_____) which sum shall also pay for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from unforeseen obstructions or difficulties encountered in the execution of the work, and for all expenses incurred by, or in consequence of the work, its suspension or discontinuance, and for well and faithfully completing the work and the whole thereof, as herein provided, and for replacing defective work or products for a period of one year after completion.

6. The Owner shall make monthly partial payments to the Contractor in accordance with the provisions of the Contract Documents.

7. Contractor shall perform all the work for this project, in accordance with the provisions of the Contract Documents.

8. This contract is conditioned on both parties' compliance with the requirements of O.C.G.A. § 13-10-91. The City of Snellville employs 100 or more employees, and is in compliance with O.G.C.A. § 13-10-91. Contractor hereby states that it has complied with the requirements of O.G.C.A. § 13-10-91, as attested to by the attached affidavit, and will obtain the employee-number category and eligibility verification from all subcontracts it uses regarding this project.

9. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the surety bonds hereto attached for its faithful performance, the Owner shall deem the sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the work, the Contractor shall, at his expense, within five (5) days after the receipt of notice from the Owner to do so, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Owner. In such event, no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Owner.

10. Disputes arising out of this contract shall be heard in the superior courts of Gwinnett County, Georgia. The Owner and Contractor agree that jurisdiction and venue are proper in the superior courts of Gwinnett County, Georgia, exclusively, and they hereby waive any defenses they may have to improper venue, lack of jurisdiction over their person, and lack of subject matter jurisdiction.

11. This agreement constitutes the entire agreement between the parties and supercedes all prior agreements or understandings between the parties.

12. In case any one or more of the provisions contained in this agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, the invalidity, illegality or unenforceablility shall not affect the other provisons, and the remaining provisions of this agreement shall be given full effect.

13. The Contractor agrees to indemnify Owner and hold Owner and its agents and employees harmless from and against all actions, causes of action, suits, liabilities, claims, damages, losses, costs and expenses (including attorney's fees and costs) arising out of or resulting from (a) any act or omission of Contractor in the performance or non-performance of the Work or its obligations hereunder, (b) any breach of contract by Contractor, and (c) any claim for injury to person or property arising out of, or in the course of, the Work as

contemplated by this Contract. The parties hereto agree that the terms of this Paragraph 5 shall survive any termination or expiration of the Contract.

In any and all claims against the Owner, or any of their agents or employees, by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefits acts.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement under their respective seals on the day and date first above written in two (2) counterparts, each of which shall without proof or accounting for the other counterparts, be deemed an original Contract.

CITY OF SNELLVILLE, GEORGIA

By: _____

Name: _____

Title: _____Seal

Attest: _____

Name: _____

Title:

_____

Approved As to Form Before Execution:

By: _____
Attorney for the Owner

Name:_____

CONTRACTOR:

By:_____

Name: _____

Title: _____Seal

Attest: _____

Name: _____

Title: _____

Signed and Sealed in the presence of:

By: _____
Notary Public

NOTE: If the Contractor is a corporation, the Agreement shall be signed by the President or Vice President, attested by the Secretary and the corporate seal affixed. If the Contractor is a partnership, the Agreement shall be signed in the partnership name by one of the partners, with indication that he is a general partner.

GENERAL CONDITIONS

1. **Notice of Award of Contract**: Proposals submitted shall be good for a ninety (90) day period (any reference herein to "day" shall mean a calendar day). Within ninety (90) days after receipt of proposal, the Owner shall notify the successful bidder of the award of the Contract.

   Should the Owner require additional time to award a Contract, the time may be extended by mutual agreement between the Owner and the successful bidder. If an Award of Contract has not been made within ninety (90) days from the bid date or within the extension mutually agreed upon, the bidder may withdraw the bid without further liability on the part of either party.

2. **Execution of Contract Documents**: With the notification of Award of Contract, the Owner shall furnish the Contractor two (2) conformed copies of Contract Documents for execution by him and his surety.

   Within five (5) days after receipt the notification of Award of Contract, the Contractor shall return all the documents properly executed by himself and his surety. Attached to each document shall be the power of attorney for the person executing the bonds for the surety and certificates of insurance for the required insurance coverage.

   Within five (5) days after receipt of the documents executed by the Contractor and his surety with the power of attorney and certificates of insurance, the Owner shall complete the execution of the documents. The General Contractor will receive one (1) copy of the completed signed documents and three (3) sets of plans and specifications.

   Should the Contractor and/or surety fail to execute the documents within time specified, the Owner shall have the right to proceed on the bid bond accompanying the bid.

   If the Owner fails to execute the documents within the time limit specified, the Contractor shall have the right to withdraw his bid without penalty.

   Should either party require an extension of any of the time limits stated above, this shall be done only by mutual agreement between both parties.

3. **Contract Security**: The Contractor shall furnish a Performance Bond and a Payment Bond in penal sums equal to the amount of the Contract Price, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and products in the prosecution of the work provided by the Contract Documents. Such bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the State of Georgia and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these bonds shall be borne by the Contractor. If at any time a surety on any such bond is declared a bankrupt or loses its right to do business in the State of Georgia or is removed from the list of Surety Companies accepted on Federal bonds, Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety shall have furnished an acceptable bond to the Owner.

   The person executing the bond on behalf of the surety shall file with the bond a general power of attorney, unlimited as to amount and type of bond covered by such power of attorney and certified to by an official of said surety.

4. **Insurance**: The Contractor shall not commence work under this Contract until all insurance described below has been obtained and such insurance has been approved by the Owner, nor shall the Contractor allow any

subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved by the Contractor.

(a) **Workmen's Compensation**: The Contractor shall procure and shall maintain during the life of the Contract Agreement, Workmen's Compensation Insurance for all of his employees to be engaged in work on the project under this Contract, and in case any such work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation insurance for all of the employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation insurance. Workmen's Compensation insurance shall include Broad Form All States endorsement.

(b) **Comprehensive General Liability**: he Contractor shall procure and shall maintain during the life of the Contract Agreement, such Comprehensive General Liability insurance as shall protect him and any subcontractor performing work covered by this Contract from claims for damages for Bodily injury, including accidental death, as well as from claims for property damages, which may arise from operations under the Contract Agreement, whether such operations are by himself or by any subcontractor or by anyone directly or indirectly employed by either of them. The amount of insurance shall not be less than the following:

$2,000,000	Bodily Injury, including death, each occurrence.
$1,000,000	Property Damage, each occurrence.
$2,000,000	Property Damage, in the aggregate.

The insurance shall include coverage of the following hazards:
Products/Completed Operations
Independent Contractors
Contractual Liability
Underground
Explosion/Collapse

(c) **Owner's Protective Liability**: The Contractor shall procure and shall maintain during the life of the Contract Agreement, Owner's Protective Liability Insurance with the same limits as the Comprehensive General Liability.

(d) **Automobile Liability**: The Contractor shall procure and shall maintain during the life of the Contract Agreement, Comprehensive Automobile Liability insurance in amounts not less than the following:

$1,000,000	Bodily Injury or death to any one person.
$1,000,000	Bodily Injury, each occurrence.
$1,000,000	Property Damage, each occurrence.

The insurance shall include coverage for non-owned and hired vehicles.

(e) **Materials and Equipment Floater**: The Contractor shall procure and shall maintain during the life of the Contract Agreement, Materials, and Equipment Floater Insurance to protect the interests of the Owner, Contractor, and subcontractor against loss by vandalism, malicious mischief, and all hazards included in a standard All Risk Endorsement including a building risk insurance for the total amount of the building bid. The amount of the insurance shall at all times equal or exceed the full amount of the Contract. The policies shall be in the names of the Owner and the Contractor.

(f) **Certificates of Insurance**: Certificates acceptable to the Owner shall be attached to the signed Contract Documents when they are transmitted to the Owner for execution. These certificates shall contain the statement that "Coverage afforded under the policies will not be canceled unless **AT LEAST THIRTY (30) days** prior to cancellation written notice has been given to the Owner, as evidenced by receipts of registered or certified mail.

5. **Indemnification**: The Contractor agrees to indemnify Owner and hold Owner and its agents and employees harmless from and against all actions, causes of action, suits, liabilities, claims, damages, losses, costs and expenses (including attorney's fees and costs) arising out of or resulting from (a) any act or omission of Contractor in the performance or non-performance of the Work or its obligations hereunder, (b) any breach of contract by Contractor, and (c) any claim for injury to person or property arising out of, or in the course of, the Work as contemplated by this Contract. The parties hereto agree that the terms of this Paragraph 5 shall survive any termination or expiration of the Contract.

   In any and all claims against the Owner, or any of their agents or employees, by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefits acts.

6. **Notice to Proceed**: The Notice to Proceed shall be issued following the pre-construction conference within three (3) days of the execution of the Contract Agreement by the Owner. If there are reasons why the Notice to Proceed should not be issued within this period, the time may be extended by mutual agreement between the Owner and Contractor. If the Notice to Proceed has not been issued within the three (3) day period or within the period mutually agreed upon, the Contractor may terminate the Contract Agreement without further liability on the part of either party.

7. **Suspension of Work, Termination and Delay**:

   (a) If the Contractor is adjudged bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the Contractor or for any of his property, or if he files a petition to take advantage of any debtors act, or to reorganize under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen, materials or equipment, or if he repeatedly fails to make prompt payments to subcontractors or for labor, materials or equipment or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the work, or if he otherwise violates any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and his surety a minimum of seven (7) days from delivery of a written notice, terminate the services of the Contractor and take possession of the project and of all products, tools, construction equipment and machinery thereon owned by the Contractor, and finish the work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the work is finished.

   If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the project, including compensation for additional professional services such excess will be paid by the Contractor and/or his surety to the Owner. Such costs incurred by the Owner will be determined by the Owner and incorporated in a change order.

   (b) Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any right of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of moneys by the Owner due to the Contractor will not release the Contractor from compliance with the Contract Documents.

   (c) After ten (10) days from delivery of a written notice to the Contractor, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the project and terminate the Contract. In such case, the Contractor shall be paid for all work executed and any expense sustained.

8. **Assignments**: The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any moneys due or to become due under this Contract, the Instrument of assignment shall contain a clause

substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior liens of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

9. **Subcontracting**:

   (a) The Contractor shall utilize the services of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

   If the Contractor desires to perform specialty work he shall submit a request to the Owner accompanied by evidence that the Contractor's own organization has successfully performed the work in question, is presently competent to perform the work, and the performance of the work by specialty subcontractors will result in materially increased costs or inordinate delays.

   (b) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

   (c) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

   (d) Nothing contained in this Contract shall create any contractual relation between any subcontractor and the Owner.

10. **Authority of the Owner**: The Owner will appoint a representative to act on its behalf during the construction period. The appointed representative shall decide questions which may arise, such as those pertaining to quality and acceptability of products furnished and work performed. He shall interpret the intent of the Contract Documents in a fair and unbiased manner. The representative will make visits to the site and determine if the work is proceeding in accordance with the Contract Documents. He shall judge as to the accuracy of quantities submitted by the Contractor in partial payment estimates and the acceptability of the work which these quantities represent. The decisions of the owners representative shall be final and conclusive and binding upon all parties to the Contract.

11. **Separate Contracts**:

   (a) The Owner reserves the right to let other contracts in connection with this project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their products and the execution of their work, and the Contractor and other Contractors shall properly connect and coordinate their work with each other. If the proper execution or results of any part of the Contractor's work depends upon the work of any other Contractor the Contractor shall inspect and promptly report to the owners representative any defects in such work that render it unsuitable for such proper execution and results.

   (b) The Owner may perform additional work related to the project with its own forces. The Contractor will afford the Owner reasonable opportunity for the introduction and storage of products and the execution of work, and shall properly connect and coordinate his work with theirs.

   (c) If the performance of additional work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to the Contractor prior to starting any such additional work. If the Contractor believes that the performance of such additional work by the Owner or others cost him an additional expense or time, he may be entitled to

additional moneys or an extension of the Contract Time. The Contractor may make a claim therefore as provided in "Changes in the Contract."

12. **Laws and Regulations**: All applicable Federal, State, and County laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract as though written out in full herein. The Contractor shall keep himself fully informed of all laws, ordinances and regulations of the Federal, State, County, and municipal governments or authorities in any manner affecting those engaged or employed in the work or the materials used in the work or in any way affecting the conduct of the work and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in these Contract Documents or in the Drawings or Specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall promptly report the same in writing to the Owner. He shall at all times observe and comply with all such existing and future laws, ordinance and regulations and shall protect and indemnify the Owner and its agents against the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

    Permits and licenses of a temporary nature, including building permits, necessary for the execution of the work shall be secured by Contractor. The City of Snellville will not charge any fees associated with any permits and licenses required by the City.

13. **Taxes**: The Contractor will pay all sales, consumer, use and other similar taxes required by the law of the place where the work is performed. The Owner will be responsible for any sales or use tax due on products furnished by the Owner to the Contractor to be incorporated into the work.

14. **Notice and Service Thereof**:

    (a) All Notices, demands, requests, instructions, approvals, and claims shall be in writing.

    (b) Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor specified in the Bid (or at such other office as the Contractor may from time to time designate to the Owner in writing), or if deposited in the United States Mail in a sealed, postage, prepaid envelope, or delivered, with charges prepaid, to any telegraph company for transmission, in each case addressed to such office.

    (c) All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the City of Snellville, at the office of the City Manager, Matthew Pepper, Snellville, Georgia. Any notice to or demand upon the Owner shall be sufficiently given if delivered to the office of the City Manager or if deposited in the United States Mail in a sealed, postage, prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission, in each case addressed to said Manager or to such other representative of the Owner or to such other address as the Owner may subsequently specify in writing to the Contractor for such purposes.

    (d) Any such notice or demand shall be deemed to have been given or made as of the time of actual delivery or (in the case of mailing) when the same should have been received in due course of post or (in the case of telegrams) at the time of actual receipt, as the case may be.

15. **Patents**: The Contractor shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the owner and its officers, agents, and employees harmless from loss on account thereof, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such infringement unless he notifies the Owner prior to the bid date.

16. **Land and Rights of Way**: The Owner will provide, as indicated in the Contract Documents and prior to Notice to Proceed, the lands upon which the work is to be done, right-of-way for access thereto, and such other lands

which are designated for the use of the Contractor. The Contractor shall confine his work and all associated activities to the easements and other areas designated for his use. The Contractor shall comply with any limits on construction methods and practices which may be required by easement agreements.

If, due to some unforeseen reason, the necessary easements are not obtained, the Contractor shall receive an equitable extension of Contract Time and/or an equitable increase in the Contract Price to cover his additional costs as a result thereof. His claim therefor shall be handled as provided for under "Changes in the Contract."

17. **Products, Services and Facilities**:

(a) It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all products labor (including labor performed after regular working hours, on Sundays, or on legal holidays), equipment, tools, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, place into operation, and deliver the work.

It is further understood that the Contractor's proposed construction schedule is based on a normal 40 hour work week, less recognized holidays. If the Contractor desires to work in excess of this limit, he shall submit a written request to the Owner a minimum of three (3) days prior to the desired work date. The Contractor shall be responsible for any additional expenses incurred by the Owner as a result of the extended work hours.

(b) Products shall be so stored in accordance with the manufacturer's recommendations to ensure the preservation of their quality and fitness for the work. Stored products to be incorporated in the work shall be located so as to facilitate prompt inspection.

(c) Manufactured products shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

(d) Products shall be furnished in accordance with shop drawings and/or samples submitted by the Contractor and approved by the Owner.

(e) Products to be incorporated into the work shall not be purchased by the Contractor or the subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which any interest is retained by the seller.

(f) The Contractor shall maintain a local office with telephone and fax. The contractor shall be required to have a responsible representative on call at all times. The Contractor will also be required to maintain a crew with necessary tools and equipment available on call after normal working hours, on weekends during inclement weather and other times when work is not in progress to perform any necessary emergency repair work which may occur as a result of the work under this Contract.

18. **Supervision of Work**: The Contractor will supervise and direct the work. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor will employ and maintain on the project site a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The superintendent shall be present on the site at all times as required to perform adequate supervision and coordination of the work.

The supervisor shall have full authority to act on behalf of the Contractor and to execute the orders or directions of the Engineer without delay. He shall have full authority to promptly supply products, tools, plant equipment and labor as may be required. His authority shall be such that all communication given to him shall be as binding as if given to the Contractor.

The Contractor shall employ only competent and skilled personnel.

The Contractor shall, upon demand from the Owner, immediately remove any Superintendent, Foreman or workman whom the Owner may consider incompetent or undesirable.

19. **Interruption of Facility Operations**: The Contractor shall provide the Owner with at least five (5) days written notice prior to any interruption in the City of Snellville of any utility operations required by construction activity. The Notice shall include the date and time of the scheduled interruption; the length of time the interruption will be in effect; the procedures to be followed in effecting the interruption; a complete identification of all those processes, equipment and operations to be affected; and all other information the Owner may require. The Contractor shall provide any equipment, piping, auxiliary power or other means necessary to sustain facility operations or function for interruptions which have not been identified by the Specifications, or when interruptions must exceed the time allowed by the Specifications.

20. **Protection of Work, Property and Persons**:

    (a) The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the work and other persons who may be affected thereby, all the work and all products to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

    (b) The Contractor will comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54). He will erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities when prosecution of the work may affect them.

    (c) The Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by him or any of his subcontractors or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

    (d) In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor without special instruction or authorization from the Owner, shall act to prevent threatened damage, injury or loss. He will give the Owner prompt written notice of any significant changes in the work or deviations from the Contract Documents caused thereby, and shall request a change order covering the changes and deviations involved.

    (e) During unseasonable weather, the Contractor shall stop all work when so directed by the Owner. Completed work and stored products shall be suitably protected.

21. **Protection of the Environment**:

    (a) All measures required to minimize water pollution to affected waters shall be undertaken in the proposed work. To achieve this end, regard shall be given to the protection of the watershed natural cover, measures instituted to assure minimal siltation and bank erosion from the construction, and other measures taken to reduce water pollution to a minimum.

    (b) Any area used or involved in the project disturbed by the Contractor, shall be restored to present or better condition even though such area is outside the limits of that specified for grading, grassing or landscaping.

    (c) All chemicals used during project construction or furnished for project operation whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.

(d) The Contractor shall so schedule his work that he does not interrupt the operation of any existing facility except as specifically allowed by the provisions of section 19, above.

Bypasses of untreated or partially treated wastes will not be permitted unless the Contractor has obtained prior approval from the Owner and the Environmental Protection Division. The Owner shall be notified in writing of the date, time and duration of such bypasses at least two weeks in advance. The Contractor shall pay all fines that may be imposed on the Owner for the bypassing of wastewater without prior approval.

(e) Necessary sanitary conveniences for the use of the laborers on the work shall be erected and maintained by the Contractor, in such a manner and at such points as shall be approved by the Owner. Their use shall be strictly enforced.

(f) Should the Contractor so desire, he may build shanties or other structures for housing tools, machinery, and supplies, but they will be permitted only at approved places, and their surroundings shall be maintained at all times in a sanitary and satisfactory manner. On or before the completion of the work, all such structures shall be removed, together with all rubbish and trash, at the expense of the Contractor.

(g) Indemnification from Environmental Claims. The Contractor shall indemnify and hold harmless the Owner from any claims for damages or penalties for environmental violations arising from the Contractor's work on the project. The Contractor shall defend and hold harmless the Owner from claims made by the Federal Environmental Protection Agency, the State Department of Natural Resources or Environmental Protection Division, and any owners of property or affected citizens for environmental damage allegedly caused by the contractor's performance of work on the project. This indemnity shall be in addition to other promises and indemnities contained herein. The Contractor covenants and agrees with the Owner that the work called for in the contract documents, including the General Conditions and project Specifications, do not call for the contractor to perform any work or use any materials which would violate applicable state and federal environmental law.

22. **Protection of Underground Utilities**: The Contractor shall protect from damage all existing improvements or utilities at or adjacent to the site of the work, the location of which is made known to him by the Owner or his agent, and shall repair or restore any damage to such facilities resulting from failure to exercise reasonable care in the performance of work, provided these facilities are located on the drawing or located by the Contractor in cooperation with the Owner of such facilities or implied and obvious from adjacent structures or known utilities. If the Contractor fails or refuses to repair any such damage promptly, the Owner may have the work performed and charge the cost thereof to the Contractor. All Contractor cost caused by construction started by others after the bid date, shall be subject to adjustment by change order as provided elsewhere.

23. **Schedules, Reports and Records**: The Contractor shall submit to the Owner progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed. Within three (3) days of the execution of the Contract by the Owner, the Contractor shall deliver to the Owner a construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various tasks required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the Progress Schedule.

The Contractor shall maintain on the project site throughout the Contract Time an up to date set of record drawings. Record Drawings shall depict the project as actually constructed; providing elevations, dimensions, angles, details, sections, etc., as required to locate all exposed or concealed features of the construction. Special attention shall be given to recording deviations from the Contract Drawings. The locations shall be referred to easily by identifiable, permanent landmarks or benchmarks, to allow future reproducibility of the measurements with a minimum of personnel and equipment.

24. **Drawings and Specifications**: The Drawings, Specifications, Contract Documents, and all supplemental documents, are considered essential parts of the Contract, and requirements occurring in one are as binding as

though occurring in all. They are intended to define, describe and provide for all work necessary to complete the project in an acceptable manner, ready for use, occupancy, or operation by the Owner.

In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings. In cases where products or quantities are omitted from the Specifications, the description and quantities shown on the Drawings shall govern.

Any discrepancies found between the Drawings and Specifications and site conditions or any inconsistencies or ambiguities in the Drawings or Specifications shall be immediately reported to the Owner, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities and prior to the Owner's correction shall be done at the Contractor's risk.

The Owner will furnish the Contractor three (3) copies of the Contract Drawings and the Specifications, one (1) copy of which the Contractor shall have available at all times on the job site.

25. **Shop Drawings**: The term shop drawings shall mean drawings, prints, desriptive literature, test reports, samples, calculations, schedules, material lists, information and items of similar meaning. The Contractor shall furnish all shop drawings for this Project within sixty days of the notice to proceed.

26. **Surveys**: The Contractor shall survey and establish all base lines for locating all the components of the work according to bench marks provided by the Owner. From this survey, unless otherwise specified in the Contract Documents, the Contractor shall develop and make all details needed for construction including slope stakes, batter boards, stakes for pile locations and other working points, lines and elevations .

    The Contractor shall carefully preserve bench marks. In case of willful or careless destruction of the bench marks, the Contractor shall be charged with the resulting expense to restablish any bench mark.

27. **Testing, Inspection and Rejection of Work**:

    (a) **Testing of Materials**: Unless otherwise specifically provided for in the Specifications, the inspection and testing of products to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies approved by the Owner and the cost of such inspection and testing shall be paid by the Contractor. The Contractor shall furnish evidence satisfactory to the Owner that the products have passed the required tests prior to their incorporation into the work. The Contractor shall promptly segregate and remove rejected products from the site of the work.

    (b) **Inspection**: The Contractor shall furnish the Owner with every reasonable facility for ascertaining whether or not the work performed and products used are in accordance with the requirements and intent of the Specifications and Contract Documents. No work shall be done or products used without suitable supervision or inspection by the Engineer or his representative. Failure to reject any defective work or product shall not in any way prevent later rejection when such defect is discovered, or obligate the Owner to final acceptance.

    (c) **Authority and Duties of the Resident Inspector**: Resident Inspectors shall be authorized to inspect all work done and all products furnished, including preparation, fabrication and manufacture of the products to be used, but they shall not be authorized to alter or waive any requirements of the Drawings, Specifications or Contract Documents. The Resident Inspector may reject products or suspend the work until any question at issue can be referred to and decided by the Owner. The responsibility of the Contractor is not lessened by the presence of the Resident Inspector.

    (d) **Rejection of Work and Materials**: All products furnished and all work done that is not in accordance with the Drawings or Specifications or that is defective will be rejected. All rejected products or work shall

be removed immediately. If rejected products or work is not removed within forty-eight (48) hours, the Owner shall have the right and authority to stop the work immediately and shall have the right to arrange for the removal of said rejected products or work at the cost and expense of the Contractor. All rejected products or work shall be replaced with other products or work which conform with the Drawings and Specifications.

(e) **Contractor's Responsibility**: Inspection of the work shall not relieve the Contractor of any of his obligations to fulfill his contract and defective work shall be made good regardless of whether such work has been previously inspected by the Owner and accepted or estimated for payment. The failure of the Owner to reject improper work shall not be considered a waiver of any defect which may be discovered later, or for work actually defective.

28. **Time for Completion and Liquidated Damages**: The Contract Time shall begin on a date specified in the Notice to Proceed issued by the Engineering Firm.

The Contractor will proceed with the work at a rate of progress which will insure completion within the Contract Time. It is expressly understood and agreed by and between the Contractor and the Owner, that the Contract Time for the completion of the work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

If the Contractor shall fail to complete the work within the Contract Time, or extended Contract Time if authorized by change orders, then the Contractor will pay to the Owner the amount of liquidated damages specified in the Contract Documents for each calendar day that the Contractor shall be in default after the time stipulated in the Contract Documents.

The Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due to the following and the Contractor has promptly given written notice of such delay to the Owner.

(a) To any preference, priority or allocation order duly issued by the Owner.

(b) To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or acts of war, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, and freight embargoes.

(c) To any delays of subcontractors occasioned by any of the causes specified in paragraphs (a) and (b).

29. **Changes in the Contract**:

(a) **Changes in the Work**: The Owner may at any time, as the need arises, order changes within the scope of the work without invalidating the Contract Agreement. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the work, an equitable adjustment shall be authorized by Change Order.

Any change in unit prices which increases the contract price by more than $50,000.00 must be approved by the Mayor and Council before a change order may take effect.

The Owner, also, may at any time, by issuing a field order, make changes in the details of the work. The Contractor shall proceed with the performance of any changes in the work so ordered by the Owner unless the Contractor believes that such field order entitles him to a change in Contract Price or time or both, in which event he shall give the Owner written notice thereof within five (5) days after the receipt of the field ordered change, and the Contractor shall not execute such changes pending the receipt of an executed Change Order or further instruction from the Owner.

Should the Contractor encounter, or the Owner discover, during the progress of the work, subsurface or latent conditions at the site materially differing from those shown on the Drawings or indicated in the Specifications, or unknown conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Drawings and Specifications, the attention of the Owner shall be called immediately to such conditions before they are disturbed. The Owner shall thereupon promptly investigate the conditions. If he finds that they do so materially differ, and upon written request of the Contractor, an equitable adjustment shall be authorized by Change Order.

The Owner may, when changes are minor or when changes would result in relatively small changes in the Contract Price or Contract Time, elect to postpone the issuance of a Change Order until such time that a single change order of substantial importance can be issued incorporating several changes. In such cases, the Owner shall indicate this intent in a written response to the Contractor's request for a change.

(b) **Changes in Contract Price**: The Contract Price may be changed only by a Change Order. The value of any work covered by a Change Order or of any claim for increase or decrease in the Contract Price shall be determined by one or more of the following methods in the order of precedence listed below:

(1) By estimating the number of unit quantities of each part of the work which is changed and then multiplying the estimated number of such unit quantities by the price bid (which price shall include the Contractor's overhead and profit) for a unit quantity thereof.

(2) The Owner shall fix the total lump sum value of the change in the work of the Contractor and shall set out the price which shall be added to or deducted from the Contract Price (which price shall include the Contractor's overhead and profit). On any change which involves a net credit to the Owner, no allowance for overhead and profit shall be figured.

(3) By ordering the Contractor to proceed with the work and to keep and present in such form as the Owner may direct a correct account of the cost of the change together with all vouchers therefor. The cost may include an allowance for overhead and profit not to exceed 15% of the net cost. The cost may also include all items of labor or materials, the use of power tools and equipment actually used, power and all items of cost such as public liability and Workmen's Compensation Insurance, pro rata charges for foremen, also Social Security, Old Age and Unemployment Insurance. If deductions are ordered, the credits shall be the net cost. Among the items considered as overhead are included insurance other than that mentioned above, bond or bonds, superintendent, timekeeper, clerks, watchmen, use of small tools, incidental job burdens and general office expenses.

Figuring changes, instructions for measurement of quantities set forth the Specifications shall be followed. The Contractor shall, when required by the Owner, furnish to the Owner an itemized breakdown of the quantities and prices used in computing the value of any change that might be ordered.

(c) **Changes in Contract Time**: The Contract Time may be changed only by a Change Order. Changes in the work described in section 29, part (a) and any other claim made by the Contractor for a change in the Contract Time (including those allowed under "Time for Completion and Liquidated Damages") shall be evaluated by the Owner and if the conditions warrant, an appropriate adjustment of the Contract Time will be made.

30. **Payments and Completion**:

(a) **Contract Price**: The Contract Price is the sum of the unit prices stated in the agreement for each item multiplied by the actual quantities installed of each item. The Contract Price is the total amount payable by the Owner to the Contractor for the performance of the work set forth in the Contract Documents.

(b) **Breakdown of Cost**: Before the first application for payment the Contractor shall submit to the Owner a breakdown of cost for the various portions of the work, including quantities if required by the Owner, aggregating the total Contract Price prepared in such form as specified or as the Owner and the Contractor may agree upon and supported by such data to substantiate its correctness as the Owner may reasonably require. This schedule, when approved by the Owner, shall be used only as a basis for the Contractor's application for payment.

(c) **Progress Payments**: At the end of each calendar month, the Contractor shall prepare an itemized application for payment supported by such other substantiating data as the Owner may reasonably require covering work completed during the month. The Contractor's Certificate for Payment shall be submitted to the Owner by the 5th of the month for consideration of payment for that month. The Contractor shall submit documentation of vendor payments for products and services, including all sub-contractors, used under this contract, lien releases and at least four photographs per day working.

The Contractor warrants and guarantees that title to all work and products covered by an Application for Payment, whether incorporated into the project or not, will pass to the Owner upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances (except retention equal in percentage to that being retained by the Owner which may be withheld from suppliers and subcontractors to guarantee completion and performance).

(d) **Certificate for Payments**: If the Contractor has made application for payment as above, the Owner will approve the Certificate for Payment, with a copy to the Contractor, for such amount as he determines to be properly due, or state in writing his itemized and specific reasons for withholding a Certificate as provided herein. The Contractor shall submit to the Owner a certificate for payment every month between the first and the fifth day of the month.

The Owner's representative has ten (10) days to approve the Certificate for Payment submitted by the contactor. The Owner shall pay to the Contractor the amount approved in the Certificate for Payment within thirty (30) days of receivng the approved form from the Owner's representative.

No certificate for a progress payment, nor any progress payment, nor any partial or entire use of occupancy of the project by the Owner, shall constitute an acceptance of any work not in accordance with the Contract Documents.

Each Certificate of Payment shall include any lien release from any manufacture or subcontractor for work done or products purchase for the project.

(e) **Retention**: The Owner shall retain the 5% of the work completed totals and 5% for the stored materials from each properly certified pay request.

No form of collateral in lieu of cash will be acceptable as retainage.

Amounts retained by the Contractor from payments due to product suppliers and subcontractors (expressed as percentage) shall not exceed that being retained by the Owner.

(f) **Payments Withheld**: The Owner may decline to approve an Application for payment and may withhold his certificate in whole or in part as may be necessary to protect the Owner from loss because of:

(l) Failure of the Contractor to make payments properly to subcontractors or for labor or products.

(2) Unsatisfactory prosecution of the work by the Contractor.

When the above reasons for non-payment are corrected, then payment shall be made for amounts withheld because of such reasons, not later than the next payment.

(g) **Failure of Payment** : If the Owner should fail to approve any Certificate for Payment, through no fault of the Contractor, within seven (7) days after receipt of the Contractor's Application for Payment, and if the Owner should fail to pay the Contractor within thirty (30) days after having received the Certificate for Payment, then the Contractor shall receive interest on the balance due with the interest being the legal annual rate of five percent (5%). In addition, the Contractor may elect, upon seven (7) days written notice to the Owner, to stop the work until payment, including interest has been received.

Completion of the Work: Upon receipt of written notice from the Contractor that the work is complete or substantially complete (except for items specifically listed by the Contractor as incomplete) and ready to be placed into service for the operating test period, the Engineer will, within a reasonable time, inspect the work. Prior to initiating the operating test, all work required by the Contract Documents, Contract Drawings, and Specifications must be completed or substantially complete before the operating test period is performed. This includes, but is not limited to the following:

(l) Performing functional tests and providing manufacturer's required certification as required in Section 01027 "Testing" and what is defined in the Specifications for each item.

(2) Furnishing completed Record Drawings.

(3) Grassing and restoration of the work area.

If the Owner finds the work of the Contractor complete or substantially complete and acceptable in accordance with the provisions of the Contract Documents and the Record Drawings accurately depict the completed work, he shall recommend to the Owner that the operating test period begin.

The operating systems test period begins when the Owner finds the Contractor's work complete or substantially complete and runs for a period of thirty (30) days minimum. During this period, the Contractor shall complete all remaining items of work, make adjustments found to be necessary, and exercise all equipment and systems.

In the event that the final inspection reveals deficiencies in meeting the Contract requirements, the Contractor shall complete all remaining items of work, and make adjustments found to be necessary. Upon receipt of written notice from the Contractor that the work is complete and ready for re-inspection, the Owner will make a final inspection.

After final inspection the Contractor will be notified in writing by the Owner of the final acceptance of the work. The date of final acceptance shall be the termination date for the Contractor's liability for the physical properties of the facilities and the beginning of the guaranty period.

Before final payment can be made, the Contractor must certify in writing to the Owner that all payrolls, materials bills, and other indebtedness connected with the project have been paid.

Contractor shall not be entitled to final payment if there is disputed indebtedness or if there are liens upon the property.

Upon completion of all work if there is disputed indebtedness or there are liens upon the property, semifinal payment may, at the Owner's option, be made in accordance with the following provisions:

(1) The Owner shall retain an amount equal to the disputed indebtedness and/or liens upon the property including all related cost and interest in connections with said disputed indebtedness and liens which the Owner may be compelled to pay upon and subsequent adjudication.

(2) The Contractor shall certify to those items of work not disputed that all payable, materials bills and other indebtedness connected with the work have been paid or otherwise satisfied.

The making and acceptance of the final payment shall constitute a waiver of claims by the Owner other than those for faulty work covered by and appearing within the warranty period.

The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and still unsettled.

31. **Guarantee**: The Contractor shall warrant and guarantee for a period of one (1) year from the date of final acceptance that the completed system or work is free from all defects due to faulty products or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

END OF SECTION

SECTION 012100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

A. Allowance is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per scope of work to be installed, that includes pricing for all unit of measurement for materials, equipment, or services, or a portion of the Work, to potentially added to the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are accepted by the owner.

1.3 PROCEDURES:

A. The allowance prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit. Material costs shall follow the “List of Unit Prices” in project manual.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCE PRICING:

A. Allowance No. 1: Undercut of on-site material under building area.

1. Description: Area under project building area is to be undercut up to ½ of the building area to 3 feet deep. Modification to performed as stated in the project Geotechnical Report. Geotechnical Report is available upon request. Classified removal of unsuitable earth, and legally dispose of off-site, including on-site material not needed, or not suitable for reuse, encountered in open excavations, in accordance with Section 31 2000 - "Earth Moving".
2. Unit of Measurement: Cubic yard (CY) of earth excavated, based on in-place surveys of volume before and after removal.

END OF SECTION

SECTION 012200

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES:

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES:

A. Unit Price No. 1: Mass Earth Excavation.

1. Description: Classified removal of unsuitable earth, and legally dispose of off-site, including on-site material not needed, or not suitable for reuse, encountered

in open excavations, in accordance with Section 31 2000 - "Earth Moving".

2. Unit of Measurement: Cubic yard (CY) of earth excavated, based on in-place surveys of volume before and after removal.

B. Unit Price No. 2: Trench Earth Excavation.

1. Description: Classified removal of unsuitable earth, and legally dispose of off-site, including earth not needed, or not suitable for reuse, encountered in trenches, in accordance with Section 31 2000 -"Earth Moving".

2. Unit of Measurement: Cubic yard (CY) of earth excavated, based on in-place surveys of volume before and after removal.

C. Unit Price No. 3: Hand Earth Excavation.

1. Description: Classified removal of unsuitable earth, and legally dispose of off-site, including earth not needed or not suitable for reuse, which must be excavated by hand, in accordance with Section 31 2000 - "Earth Moving"

2. Unit of Measurement: Cubic yard in-place (CY) of earth excavated, based on survey of in-place surveys volume of before and after removal.

D. Unit Price No. 4: Additional Soil.

1. Item No. 4a – Topsoil:
   a. Description: Provide additional topsoil from offsite locations, in accordance with Section 31 2000 "Earth Moving", and applicable portions of other sections.
   b. Unit of Measurement: Cubic yard (CY) of topsoil, in place.
2. Item No. 4b - General or Open Site Areas:
   a. Description: Provide acceptable earth fill in general or open site areas, compacted to meet requirements specified for the affected area, in accordance with Section 31 2000 "Earth Moving", as directed by the Owner's Geotechnical Engineer.
   b. Unit of Measurement: Cubic yard (CY) of fill, compacted in place.
3. Item No. 4c - Trench Backfill:
   a. Description: Provide acceptable backfill in trenches, compacted to meet requirements specified for the affected area, in accordance with Section 31 2000 "Earth Moving", as directed by the Owner's Geotechnical Engineer.
   b. Unit of Measurement: Cubic yard (CY) of backfill, compacted in place.
4. Item No. 4d - Off-site Select Fill:
   a. Description: Provide acceptable select fill obtained from offsite locations, compacted to meet the requirements specified for the affected area, in accordance with Section 31 2000 "Earth Moving", as directed by the Owner's Geotechnical Engineer.
   b. Unit of Measurement: Cubic Yard (CY) of fill, compacted in place.

E. Unit Price No. 5: Concrete Mud Footings.

1. Description: Provide additional concrete mud footings, in addition to any mud footings indicated on the Drawings, as specified in Section 03 3100 - “Concrete”, as directed or required by the Owner's Geotechnical Engineer, due to any existing unsuitable soils.

2. Unit of Measurement: Cubic yard (CY) of concrete mud footings, in place.

3. Note: This unit price is not applicable to cost of mud footings that are required due to over-excavation, or due to not pouring footings the same date they are excavated, or other reasons indicated in Section 31 2000 - “Earth Moving,” or Section 03 3100 - “Concrete”

F. Unit Price No. 6: Undercut & Backfill in Building Control Areas.

1. Description: Undercutting below planned subgrade in building control areas, and at least 10-feet beyond, as required due to careful inspection by probing, proofrolling, and testing shall be paid on a unit price basis per cubic yard of undercut. Unit price shall include excavation and legal off-site disposal of unsuitable material and replacement with compacted controlled fill back to subgrade elevation in cuts and back to original grade in fills in accordance with Section 31 3200 - "Earth Moving" as directed by the Owner's Geotechnical Engineer. This shall not apply to previously prepared areas of the site that may become unstable due to construction traffic, rain, etc.

2. Unit of Measurement: Cubic Yard (CY) of unsuitable material.

G. Unit Price No. 7: Undercut & Backfill in Non-Building Control Areas.\

1. Description: Undercutting below planned subgrade in all areas not included in the building control areas as required due to careful inspection by probing, proof rolling, and testing shall be paid on a unit price basis per cubic yard in-place of undercut. Unit price shall include excavation and legal off-site disposal of unsuitable material and replacement with compacted controlled fill back to subgrade elevation in cuts and back to original grade in fills in accordance with Section 31 2000 - "Earth Moving". This shall not apply to previously prepared areas of the site that may become unstable due to construction traffic, rain, etc.

2. Unit of Measurement: Cubic Yard (CY) of unsuitable material.

H. Unit Price No. 8: Graded Aggregate.

1. Description: Provide additional graded aggregate, as per GDOT Standard Specifications for Highway Construction Section 815 Group 1 or approved equal, as directed by the Owner's Geotechnical Engineer.

2. Unit of Measurement: Ton (TN) of crushed stone in place.

END OF SECTION

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

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

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 10 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Request for Information (RFI).
   4. Digital project management procedures.
   5. Project meetings.

1.3 SUBMITTALS:

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

B. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.
   1. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses.
   2. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

   3. Post copies of list in project meeting room, in temporary field office and in prominent location in built facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES:

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate

construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination.

1. Include such items as required notices, reports, and list of attendees at meetings.
2. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS:

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
    a. DWG Version AutoCAD20, operating in Microsoft Windows operating system.

7. File Submittal Format: Submit or post coordination drawing files using PDF format
8. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in AutoCAD v19
    c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual

1.6 REQUEST FOR INFORMATION (RFI):

A. RFI Procedure: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
    1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
    2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
    1. Project name.
    2. Project number.
    3. Date.
    4. Name of Contractor.
    5. Name of Architect.

6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Use AIA Document G716 or software-generated form with substantially the same content as indicated above, acceptable to Architect. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to the General Conditions of the Contract. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following information in the log:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

1.7 PROJECT MEETINGS:

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of ten (10) working days prior to meeting.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Responsibilities and personnel assignments, including designation of key personnel and their duties.
      b. Tentative construction schedule.
      c. Phasing.
      d. Critical work sequencing and long lead items.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of Record Documents.
      m. Use of the premises.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. First aid.

y. Security.
z. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than ninety (90) days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Owner's partial occupancy requirements.
    l. Installation of Owner's furniture, fixtures, and equipment.
    m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: Representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule.
        1) Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
        2) Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        3) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.

7) Site use.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of Proposal Requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
5. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
3. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action; informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Architect's final release or approval.
   g. Scheduled date of fabrication.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
5. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittal Identification: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Name of subcontractor.
   f. Name of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.
   l. Other necessary identification.
4. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract

Documents, initial submittal may serve as final submittal. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

5. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
   a. Transmittal Form: Use AIA Document G810 or CSI Form 12.1A.
   b. Indicate the following on transmittal:
      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect.
      6) Name of Contractor.
      7) Name of firm or entity that prepared submittal.
      8) Names of subcontractor, manufacturer, and supplier.
      9) Category and type of submittal.
      10) Submittal purpose and description.
      11) Specification Section number and title.
      12) Specification paragraph number or drawing designation and generic name for each of multiple items.
      13) Drawing number and detail references, as appropriate.
      14) Indication of full or partial submittal.
      15) Transmittal number, numbered consecutively.
      16) Submittal and transmittal distribution record.
      17) Remarks.
      18) Signature of transmitter.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
   4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
      a. Project name.
      b. Date.
      c. Name and address of Architect.
      d. Name of Contractor.
      e. Name of firm or entity that prepared submittal.
      f. Names of subcontractor, manufacturer, and supplier.
      g. Category and type of submittal.
      h. Submittal purpose and description.
      i. Specification Section number and title.
      j. Specification paragraph number or drawing designation and generic name for each of multiple items.

k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

D. Options: Identify options requiring selection by Architect.

E. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
   a. Architect will return annotated file.
   b. Annotate and retain one copy of file as an electronic Project record document file.
2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and

certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submittal Method: Submit Product Data in PDF electronic file format.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Templates and patterns.
   g. Compliance with specified standards.
   h. Notation of coordination requirements.
   i. Notation of dimensions established by field measurement.
   j. Relationship and attachment to adjoining construction clearly indicated.
   k. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 40 inches.

3. Submittal Method: Submit Shop Drawings PDF electronic file format.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.
      e. Specification paragraph number and generic name of each item.
   3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line.
      b. Architect will return submittal with options selected.
   5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected.
      a. Samples include, but are not limited to partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
      b. Number of Samples: Submit three (3) sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
         1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
         2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
   1. Include the following information in tabular form:
      a. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
      b. Manufacturer and product name, and model number if applicable.
      c. Number and name of room or space.
      d. Location within room or space.
   2. Submittal Method: Submit product schedule in PDF electronic file format.

F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 1 Section "Quality Requirements."

G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 1 Section "Project Closeout."

H. Maintenance Data: Comply with requirements specified in Division 1 Section "Project Closeout."

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents.
   1. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms.
   2. Include names of firms and personnel certified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on

evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

T. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

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

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents.
2. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
1. "NO EXCEPTIONS TAKEN" indicates that fabrication may begin on all items.
2. "REJECTED" indicates that the submission is unacceptable and requires resubmission. In the case of mock-up, reconstruction will be required. Contractor shall make corrections as noted and resubmit. Fabrication shall not begin on items covered by shop drawings bearing this notation.
3. "MAKE CORRECTIONS NOTED" indicates that Contractor shall make the corrections indicated on the returned submittal. This notation will permit fabrication to begin on all items subject to the corrections indicated.
4. “AMEND AND RESUBMIT” indicates that contractor shall delay fabrication on items affected by the corrections, make appropriate changes and resubmit.
5. "SUBMIT SPECIFIED ITEM" indicates that the item submitted is not specified and unacceptable. Submittal will be returned without review. Only the item specified is to be submitted for review.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
   4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.
   1. Mockups are not Samples.
   2. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

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

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

C. Special Inspection and Testing Agency Reports: The special inspector's reports and testing agency's results shall have precedence over reports and test results provided by the Contractor.

1.5 SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

1.7 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations.
1. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

2. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an A2LA independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
3. A2LA: A testing agency accredited by the American Association for Laboratory Accreditation.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   e. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction. Allow seven (7) days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and

conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

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

G. Coordination:
1. Coordinate sequence of activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
2. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes.
2. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
3. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014150

SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY

A. Description:

1. This Section includes the procedural requirements for quality assurance for Special Inspections.

2. Special Inspection and Testing services are required to provide a detailed verification of compliance with the Construction Documents, codes and standards specified. Special Inspection services and the presence of Special Inspectors on site do not relieve the Contractor of responsibility for compliance with the Construction Document requirements.

3. The Registered Design Professional for Special Inspections is typically the Architect or Structural Engineer. Often the Architect will take input from the Structural, Mechanical and Electrical Engineers and act as the overall Registered Design Professional in Responsible Charge of preparing and submitting the Statement of Special Inspections.

B. Related Documents and Standards:

1. All Special Inspections on this project shall conform to the Construction Documents and the applicable building code including referenced standards, in addition to this document. The Special Inspections Package has been submitted as part of the Construction Documents. These documents describe Contractor responsibilities, Fabricator responsibilities, required inspections/testing and inspections/testing frequency.

2. Hold a Special Inspections preconstruction meeting at least 7 days prior to initial planned date for start of work requiring Special Inspections.
   a. Discussions shall include the following:
      1) Review of specifications and Schedule of Special Inspections for work requiring Special Inspections.
      2) Responsibilities of Contractor, Owner, Testing Agency, Special Inspector, and Registered Design Professional.
   b. Notification and reporting procedures.

3. Attendees shall include Contractor, Owner's Representative, Testing Agency, Special Inspector, and Registered Design Professionals for Structural Engineering and Architecture.

C. Related Sections:
1. Division 03 Specifications – Concrete Construction
2. Division 04 Specifications – Masonry Construction
3. Division 05 Specifications – Steel Construction
4. Division 31 Specifications – Earthwork.

D. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 QUALITY CONTROL

A. Special Inspections shall be performed by agents who have relevant experience for each category of inspections. Minimum qualifications and certifications for each category are indicated in the building code.

B. Special Inspections and Testing: Owner will engage an agency to conduct Special Inspections and Testing as described in the referenced Special Inspections documentation and as required by authorities having jurisdiction.

1. Special Inspector and his agents will notify Registered Design Professional and Contractor of deficiencies observed the Work.

2. Special Inspector and his agents will submit a certified written report of each test, inspection and similar quality-control service.

3. Special Inspector and his agents will submit a Final Report of Special Inspections at the completion of the Special Inspections stating work was completed in substantial conformance with Construction Documents. Final Report of Special Inspections shall state required inspections have been performed and itemize nonconforming work not corrected or resolved as coordinated with the Design Professional in Responsible Charge. Final Report of Special Inspections is

included with the Statements of Special Inspections for use by the Special Inspector(s) and his agents.

4. Special Inspector and his agents will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Construction Documents.

5. Special Inspector and his agents will retest and reinspect corrected work.

6. Owner's selection of a Special Inspector in no way relieves the Contractor of responsibility to perform work in full compliance with Construction Documents.

C. Special Inspector and Agency Qualification Data: Inspection agencies shall submit a copy of their qualifications, including names and qualifications of each inspector and technician who will be performing inspections or tests, to the Code Enforcement Official. Special Inspector and Agency shall be acceptable to the Code Enforcement Official.

D. Reports: Special Inspectors shall submit inspection reports of each test or inspection to Contractor, Architect of Record, Structural Engineer of Record, Design Professional Responsible Charge, and the Owner. Reports to be submitted on forms approved by the Design Professional in Responsible Charge. All deficiencies shall be highlighted in reports and presence of deficiencies shall be noted within the report title.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of certifications, inspection reports, releases, deficiencies, Architect/Engineer sketches regarding deficiencies, correspondence, records, and similar documents established for compliance with the Special Inspections program documented by the Special Inspection Statement and Schedule.

F. Owner shall provide all completed Special Inspection forms and schedule of Special Inspections to Special Inspector(s) with all Construction Documents and document changes.

3.1 SPECIAL INSPECTION FORMS

A. Statements of Special Inspections: The attached Statements of Special Inspections, completed the registered Design Professional in Responsible Charge, shall be submitted to the Building Official at the time of permit application. Copies of the forms, approved by the Building Officials shall be kept by the Contractor at a central location on the project site an submitted to the Design Professional in Responsible Charge.

B. Schedule of Special Inspections: The Schedule of Special Inspections shall be submitted to the Building Official at the time of permit application. Special Inspectors shall initial and date each item in the "Completed" column when the inspections for the specific scope of work are completed. A copy of the Schedule of Special Inspections containing signatures for all tasks requiring inspection shall be submitted to the Design Professional in Responsible Charge with the Final Reports of Special Inspections.

C. Contractor's Statement of Responsibility: Contractor shall review the Statements of Special Inspections and Schedule of Special Inspections. Contractor shall complete the Contractor Statement of Responsibility and submit the statement to the Design Professional in Responsible Charge.

D. Final Report of Special Inspections: The Final Report of Special Inspections (blank report is submitted with the Statements of Special Inspections and Schedule, or reference) shall be submitted to the Building Official when all Special Inspection requirements for the project are completed and there are no outstanding deficiencies in work scheduled for inspections/testing. Each Special Inspection agency noted in the Schedule is required to submit a copy of this form for their scope of work.

3.2 OWNER RESPONSIBILITIES

A. Owner will engage and pay for services of Special Inspector and his agents.

B. Owner will engage either the Architect or one of his consultants to act as the Design Professional in Responsible Charge and pay for services of administrating this program.

3.3 CONTRACTOR RESPONSIBILITIES

A. Contractor to whom building permit is issued shall have and maintain responsibility to manage, direct and control construction activities on Project for which building permit is issued.

B. Contractor shall designate a representative who shall be the direct point-of-contact with the Special Inspector(s) during each phase of work. Designated representative will work with Special Inspector(s) and Design Professional in Responsible Charge to communicate and coordinate for corrective actions required for discrepancies noted during work progress.

C. Contractor shall review the Schedule of Special Inspections to become familiar with all of the required testing and inspections and shall cooperate with Special Inspector(s) to provide access to construction activities and Manufacturer's operations that are to be tested/inspected.

D. Provide required copies of product test reports to Special Inspector(s).

E. Secure and deliver to Special Inspector(s) adequate quantities of representative material samples that require testing/inspection as part of the Schedule of Special Inspections.

F. Provide incidental labor and facilities:
   1. To facilitate tests and inspections that are required by Special Inspections and noted in the Schedule of Special Inspections.
   2. To provide access to construction activities to be tested.
   3. To obtain and handle samples at Project site or at source of product to be tested.
   4. For storage and curing of test samples.

G. Notify Special Inspection(s) and his agents at least 48 hours in advance of required inspection or test:
   1. When tests or inspections cannot be performed after such notice, immediately notify Special Inspector(s)to discuss alterations of work and subsequent inspection(s) to allow for required testing/inspection by Special Inspector(s).
   2. If the Special Inspector is not notified in time to cancel and reschedule any required inspection, the Contractor shall reimburse Owner through Change Order procedure for Special Inspector(s) personnel and travel expenses incurred. Cointractor, Special Inspector, and Owner shall develop procedures and associated costs for the Change Order procedure noted.

H. Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Construction Document requirements, regardless of whether original test was Contractor's responsibility.

I. Cost of construction related to retesting, deficiencies, corrective work, revised or replaced by Contractor, is Contractor's responsibility where required tests performed on original construction indicated noncompliance with Construction Document requirements.

J. Contractor shall be solely responsible for construction site safety.

3.4 SPECIAL INSPECTOR(S) RESPONSIBILITIES

A. Review all Special Inspection statements and the Schedule of Special Inspections and become familiar with the structural design for the project and construction requirements, such that the Inspector(s) and his agents may provide adequate verification observations to assure conformance with Construction Documents.

B. Review Construction Documents and reference documents cited in sufficient detail that he may assure himself that conformance is provided.

C. Contact local Enforcement Agency/Building Official and Design Professional in Responsible Charge to determine requirements for testing/inspection report and nonconformance log formatting and frequency. Determine if all reporting will be transmitted to the Design Professional in Responsible Charge or if any of the reporting must also be transmitted directly from the Special Inspector(s) to the local Enforcement Agency/Building Official.

D. Consult with the Design Professional in Responsible Charge for clarification regarding questions from the site, deficiencies, and misinterpretations of the work.

E. Attend preconstruction meetings and routine job conferences called by Contractor.

F. Provide on-site testing, inspections, and observations of phases of work in accordance with frequencies noted for each type of inspection in the Schedule of Special Inspections and to assure himself Contractor is performing work in accord with Construction Documents.

G. Receive and review required Contractor submittals for verification of conformance to Construction Documents.

H. Provide local Enforcement Agency/Building Official and Design Professional in Responsible Charge with periodic Special Inspection reports, all testing/inspection documentation, and reports of outstanding/resolved nonconformances with report formats and report frequencies coordinated at the start of the Special Inspections program.

3.5 LIMITS ON AUTHORITY

A. Special Inspector and his agents shall not release, revoke, alter, or enlarge on requirements of Construction Documents.

B. Special Inspector and his agents shall not have control over Contractor's means and methods of construction.

C. Special Inspector and his agents shall not have authority to stop work.

3.6 COMMUNICATION

A. Testing Agency shall immediately notify Contractor and Registered Design Professional by email of test results or inspections failing to comply with requirements of the Construction Documents.

B. Special Inspector shall immediately notify Contractor of work found to be in nonconformance with the Construction Documents. If nonconforming work is not corrected while the Special Inspector is on-site, Special Inspector shall notify Registered Design Professional within 24 hours (one business day) and issue a nonconformance report.

C. If nonconforming work is not corrected at time of substantial completion of structure or other appropriate time, Special Inspector shall notify Code Enforcement Official.

D. Special Inspector and his agents submit reports within 7 days of inspection or test.

3.7 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

B. Protect construction exposed by, or for, quality control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014150

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: Briscoe Park Recreation Center

LOCATION: 2500 Sawyer Parkway, S.W., Snellville, GA 30078

PERMIT APPLICANT: City of Snellville, Matthew Pepper, Owner Representative

APPLICANT'S ADDRESS: 2342 Oak Road, Snellville, GA 30078

ARCHITECT OF RECORD: Goodwyn, Mills & Cawood, LLC.

STRUCTURAL ENGINEER OF RECORD: Michael Planer, PE, SE, PES Structural Engineers

MECHANICAL ENGINEER OF RECORD: Greg Cox, PE, Matheson Ball

ELECTRICAL ENGINEER OF RECORD: John Averrett, PE, Goodwyn Mills Cawood

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: Mark Videkovich, R.A., Goodwyn Mills Cawood

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2018 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Special Inspections for Seismic Resistance* and/or *Special Inspections for Wind Resistance*.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Special Inspections for Wind Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__Weekly __Bi-Weekly __Monthly Other; specify: as req'd by RDPiRC

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Preparer's Seal

Type or print name

Signature Date

Building Official's Acceptance:

Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion Other: specify:as req'd by AHJ

Special Inspections for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: C

Special Inspections for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Where required per IBC Sections 1705.12.1, 1705.12.2, and 1705.12.3) (Special inspections for seismic resistance of structural steel, where required, shall be in accordance with AISC 341)

Description of designated seismic systems subject to special inspection and testing for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories C, D, E or F.)

Description of additional seismic systems and components requiring special inspections:
(Required for systems noted in IBC Section 1705.12.5, 1705.12.6, 1705.12.7, and 1705.12.8.)

Description of additional seismic systems and components requiring testing:
(Where required per IBC Section 1705.13)

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

Special Inspections for Wind Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Allowable Stress Design Wind Speed, V_{asd}: 89 m.p.h.

Wind Exposure Category: C

Special Inspection for Wind Resistance Required (Yes/No): No
(Required in wind exposure Category B, where the allowable stress design wind speed, V_{asd}, is 120 miles per hour or greater. Required in wind exposure Category C or D, where the allowable stress design wind speed, V_{asd}, is 110 miles per hour or greater).)

Description of structural wood and cold-formed steel light frame construction main windforce-resisting system subject to special inspections for wind resistance:
(Required for systems noted in IBC Section 1705.11.1 and 1705.11.2).

Description of windforce-resisting components subject to special inspections for wind resistance:
(Required for systems and components noted in IBC Section 1705.11.3)

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
1705.1.1 Special Cases (work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements)	Submittal review, shop[3] and/or field inspection	N			
1705.2.1 Structural Steel Construction					
1. Fabricator and erector documents (Verify reports and certificates as listed in AISC 360, Section N 3.2 for compliance with construction documents)	Submittal Review	Y	Each submittal		
2. Material verification of structural steel	Shop[3] and field inspection	Y	Periodic		
3. Structural steel welding: Inspection tasks prior to welding.					
a. Verify welder qualification records and continuity records.	Shop[3] and field inspection	Y	Observe[4]		
b. Verify welding procedure specifications (WPSs) available.	Shop[3] and field inspection	Y	Perform[4]		
c. Verify manufacturer certifications for welding consumables available.	Shop[3] and field inspection	Y	Perform[4]		
d. Verify material identification (type/grade).	Shop[3] and field inspection	Y	Observe[4]		
e. Verify welder identification system (The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type)	Shop[3] and field inspection	Y	Observe[4]		
f. Verify fit-up of groove welds (including joint geometry):					
i. Joint preparations	Shop[3] and field inspection	Y	Observe[4]		
ii. Dimensions (alignment, root opening, root face, bevel)	Shop[3] and field inspection	Y	Observe[4]		
iii. Cleanliness (condition of steel surfaces)	Shop[3] and field inspection	Y	Observe[4]		
iv. Tacking (tack weld quality and location)	Shop[3] and field inspection	Y	Observe[4]		
v. Backing type and fit (if applicable)	Shop[3] and field inspection	Y	Observe[4]		
g. Verify fit-up of CJP groove welds of HSS T-, Y- and K-joints without backing (including joint geometry):					
i. Joint preparations	Shop[3] and field inspection	Y	Observe[4]		
ii. Dimensions (alignment, root opening, root face, bevel)	Shop[3] and field inspection	Y	Observe[4]		
iii. Cleanliness (condition of steel surfaces)	Shop[3] and field inspection	Y	Observe[4]		
iv. Tacking (tack weld quality and location)	Shop[3] and field inspection	Y	Observe[4]		
h. Verify configuration and finish of access holes.	Shop[3] and field inspection	Y	Observe[4]		
i. Verify fit-up of fillet welds:					
i. Dimensions (alignment, gaps at root)	Shop[3] and field inspection	Y	Observe[4]		
ii. Cleanliness (condition of steel surfaces)	Shop[3] and field inspection	Y	Observe[4]		
iii. Tacking (tack weld quality and location)	Shop[3] and field inspection	Y	Observe[4]		
4. Structural steel welding: Inspection tasks during welding.					
a. Verify control and handling of welding consumables:					
i. Packaging	Shop[3] and field inspection	Y	Observe[4]		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
ii. Exposure control	Shop[3] and field inspection	Y	Observe[4]		
b. Verify no welding over cracked tack welds.	Shop[3] and field inspection	Y	Observe[4]		
c. Verify environmental conditions:					
i. Wind speed within limits	Shop[3] and field inspection	Y	Observe[4]		
ii. Precipitation and temperature	Shop[3] and field inspection	Y	Observe[4]		
d. Verify WPS followed:					
i. Settings on welding equipment	Shop[3] and field inspection	Y	Observe[4]		
ii. Travel speed	Shop[3] and field inspection	Y	Observe[4]		
iii. Selected welding materials	Shop[3] and field inspection	Y	Observe[4]		
iv. Shielding gas type/flow rate	Shop[3] and field inspection	Y	Observe[4]		
v. Preheat applied	Shop[3] and field inspection	Y	Observe[4]		
vi. Interpass temperature maintained (min./max.)	Shop[3] and field inspection	Y	Observe[4]		
vii. Proper position (F, V, H, OH)	Shop[3] and field inspection	Y	Observe[4]		
e. Verify welding techniques:					
i. Interpass and final cleaning	Shop[3] and field inspection	Y	Observe[4]		
ii. Each pass within profile limitations	Shop[3] and field inspection	Y	Observe[4]		
iii. Each pass meets quality requirements	Shop[3] and field inspection	Y	Observe[4]		
f. Verify placement and installation of steel headed stud anchors	Shop[3] and field inspection	Y	Perform[4]		
5. Structural steel welding: Inspection tasks after welding.					
a. Verify welds cleaned	Shop[3] and field inspection	Y	Observe[4]		
b. Verify size, length and location of welds	Shop[3] and field inspection	Y	Perform[4]		
c. Verify welds meet visual acceptance criteria:					
i. Crack prohibition	Shop[3] and field inspection	Y	Perform[4]		
ii. Weld/base-metal fusion	Shop[3] and field inspection	Y	Perform[4]		
iii. Crater cross section	Shop[3] and field inspection	Y	Perform[4]		
iv. Weld profiles	Shop[3] and field inspection	Y	Perform[4]		
v. Weld size	Shop[3] and field inspection	Y	Perform[4]		
vi. Undercut	Shop[3] and field inspection	Y	Perform[4]		
vii. Porosity	Shop[3] and field inspection	Y	Perform[4]		
d. Verify arc strikes	Shop[3] and field inspection	Y	Perform[4]		
e. Verify k-area (When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in.of the weld)	Shop[3] and field inspection	Y	Perform[4]		
f. Verify weld access holes in rolled heavy shapes and built-up heavy shapes (After rolled heavy shapes (see Section A3.1c) and built-up heavy shapes (see Section A3.1d) are welded, visually inspect the weld access hole for cracks)	Shop[3] and field inspection	Y	Perform[4]		
g. Verify backing removed and weld tabs removed (if required)	Shop[3] and field inspection	Y	Perform[4]		
h. Verify repair activities	Shop[3] and field inspection	Y	Perform[4]		
i. Document acceptance or rejection of welded joint or member	Documentation	Y	Perform[4]		
j. Verify no prohibited welds have been added without the approval of the SEOR	Shop[3] and field inspection	Y	Observe[4]		
6. Nondestructive testing (NDT) of welded joints.					
a. Complete penetration groove welds 5/16" or greater in *risk category* III or IV	Shop[3] or field ultrasonic testing - 100%	Y	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
b. Complete penetration groove welds 5/16" or greater in *risk category* II	Shop[3] or field ultrasonic testing - 10% of welds minimum	N	Periodic		
c. Welded joints subject to fatigue when required by AISC 360, Appendix 3, Table A-3.1	Shop[3] or field radiographic or Ultrasonic testing	Y	Periodic		
d. Fabricator's NDT reports when fabricator performs NDT	Verify reports	Y	Each submittal[5]		
7. Structural steel bolting: Inspection tasks prior to bolting.					
a. Verify manufacturer's certifications available for fastener materials	Shop[3] and field inspection	Y	Perform[4]		
b. Verify fasteners marked in accordance with ASTM requirements	Shop[3] and field inspection	Y	Observe[4]		
c. Verify correct fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)	Shop[3] and field inspection	Y	Observe[4]		
d. Verify correct bolting procedure selected for joint detail	Shop[3] and field inspection	Y	Observe[4]		
e. Verify connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	Shop[3] and field inspection	Y	Observe[4]		
f. Verify pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used	Shop[3] and field inspection	Y	Observe[4]		
g. Verify protected storage provided for bolts, nuts, washers and other fastener components	Shop[3] and field inspection	Y	Observe[4]		
8. Structural steel bolting: Inspection tasks during bolting.					
a. Verify fastener assemblies placed in all holes and washers and nuts are positioned as required	Shop[3] and field inspection	Y	Observe[4]		
b. Verify joint brought to the snug-tight condition prior to the pretensioning operation	Shop[3] and field inspection	Y	Observe[4]		
c. Verify fastener component not turned by the wrench prevented from rotating	Shop[3] and field inspection	Y	Observe[4]		
d. Verify fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges	Shop[3] and field inspection	Y	Observe[4]		
e. Pre-tensioned and slip-critical joints					
i. Turn-of-nut with matching markings		Y	Periodic		
ii. Direct tension indicator		Y	Periodic		
iii. Twist-off type tension control bolt		Y	Periodic		
iv. Turn-of-nut without matching markings		Y	Continuous		
v. Calibrated wrench		Y	Continuous		
f. Snug-tight joints		Y	Periodic		
9. Structural steel bolting: Inspection tasks after bolting.					
a. Document acceptance or rejection of bolted connections	Documentation	Y	Perform		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
10. Visual inspection of exposed cut surfaces of galvanized structural steel main members and exposed corners of the rectangular HSS for cracks subsequent to galvanizing	Shop[3] or field inspection	Y	Periodic		
11. Inspection of anchor rods and other embedments supporting structural steel (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection	Y	Periodic		
12. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection	Y	Periodic		
1705.2.2 Cold-Formed Steel Deck					
1. Inspection tasks prior to deck placement					
a. Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness	Shop[3] and field inspection	Y	Perform[4]		
b. Document acceptance or rejection of deck and deck accessories	Documentation	Y	Perform[4]		
2. Inspection tasks after deck placement					
a. Verify compliance of deck and all deck accessories installation with construction documents	Shop[3] and field inspection	Y	Perform[4]		
b. Verify deck materials are represented by the mill certifications that comply with the construction documents	Shop[3] and field inspection	Y	Perform[4]		
c. Document acceptance or rejection of installation of deck and deck accessories	Documentation	Y	Perform[4]		
3. Inspection tasks prior to welding					
a. Welding procedure specifications (WPS) available	Shop[3] and field inspection	Y	Observe[4]		
b. Manufacturer certifications for welding consumables available	Shop[3] and field inspection	Y	Observe[4]		
c. Material identification (type/grade)	Shop[3] and field inspection	Y	Observe[4]		
d. Check welding equipment	Shop[3] and field inspection	Y	Observe[4]		
4. Inspection tasks during welding					
a. Use of qualified welders	Shop[3] and field inspection	Y	Observe[4]		
b. Control and handling of welding consumables	Shop[3] and field inspection	Y	Observe[4]		
c. Environmental conditions (wind speed, moisture, temperature)	Shop[3] and field inspection	Y	Observe[4]		
d. WPS followed	Shop[3] and field inspection	Y	Observe[4]		
5. Inspection tasks after welding					
a. Verify size and location of welds, including support, sidelap, and perimeter welds	Shop[3] and field inspection	Y	Perform[4]		
b. Welds meet visual acceptance criteria	Shop[3] and field inspection	Y	Perform[4]		
c. Verify repair activities	Shop[3] and field inspection	Y	Perform[4]		
d. Document acceptance or rejection of welds	Documentation	Y	Perform[4]		
6. Inspection tasks prior to mechanical fastening					
a. Manufacturer installation instructions available for mechanical fasteners	Shop[3] and field inspection	Y	Observe[4]		
b. Proper tools available for fastener installation	Shop[3] and field inspection	Y	Observe[4]		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
c. Proper storage for mechanical fasteners	Shop[3] and field inspection	Y	Observe[4]		
7. Inspection tasks during mechanical fastening					
a. Fasteners are positioned as required	Shop[3] and field inspection	Y	Observe[4]		
b. Fasteners are installed in accordance with manufacturer's instructions	Shop[3] and field inspection	Y	Observe[4]		
8. Inspection tasks after mechanical fastening					
a. Check spacing, type, and installation of support fasteners	Shop[3] and field inspection	Y	Perform[4]		
b. Check spacing, type and installation of sidelap fasteners	Shop[3] and field inspection	Y	Perform[4]		
c. Check spacing, type, and installation of perimeter fasteners	Shop[3] and field inspection	Y	Perform[4]		
d. Verify repair activities	Shop[3] and field inspection	Y	Perform[4]		
e. Document acceptance or rejection of mechanical fasteners	Documentation	Y	Perform[4]		
1705.2.3. Open-Web Steel Joists and Joist Girders					
1. Installation of open-web steel joists and joist girders.					
a. End connections - welding or bolted.	per SJI CJ or SJI 100	Y	Periodic		
b. Bridging - horizontal or diagonal.					
1) Standard bridging.	per SJI CJ or SJI 100	Y	Periodic		
2) Bridging that differs from the specifications listed in SJI CJ or SJI 100.		Y	Periodic		
1705.2.4. Cold-Formed Steel Trusses Spanning 60 feet or Greater					
1. Verify temporary installation restraint/bracing and permanent individual member restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic		
1705.3 Concrete Construction					
1. Inspect reinforcement, including prestressing tendons, and verify placement.	Shop[3] and field inspection	Y	Periodic		
2. Reinforcing bar welding:					
a. Verify weldability of bars other than ASTM A706.	Shop[3] and field inspection	Y	Periodic		
b. Inspection of single-pass fillet welds, maximum 5/16".	Shop[3] and field inspection	Y	Periodic		
c. Inspect all other welds.	Shop[3] and field inspection	Y	Continuous		
3. Inspection of anchors cast in concrete.	Shop[3] and field inspection	Y	Periodic		
4. Inspection of anchors and reinforcement post-installed in hardened concrete[6]					
a. Adhesive anchors installed in horizontal or upward-inclined orientation, and reinforcement installed in any orientation:					
i. Verify hole drilling method in accordance with the MPI	Field inspection	Y	Continuous		
ii. Verify anchor edge distance and spacing	Field inspection	Y	Continuous		
iii. Verify hole diameter and depth	Field inspection	Y	Continuous		
iv. Verify hole cleaning in accordance with the MPI	Field inspection	Y	Continuous		
v. Verify anchor element type, material, diameter, and length	Field inspection	Y	Continuous		
vi. Verify adhesive identification and expiration date	Field inspection	Y	Continuous		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
vii. Verify adhesive installation in accordance with the MPI	Field inspection	Y	Continuous		
viii. Verify installer certification in accordance with ACI/CRSI Adhesive Anchor Installer Certification program	Verify	Y	Each Installer		
b. Proof loading[7]	Field testing	Y	Periodic[7]		
c. Mechanical and adhesive anchors not defined in 4a:					
i. Verify hole drilling method in accordance with the MPI	Field inspection	Y	Periodic		
ii. Verify anchor edge distance and spacing	Field inspection	Y	Periodic		
iii. Verify hole diameter and depth	Field inspection	Y	Periodic		
iv. Verify hole cleaning in accordance with the MPI	Field inspection	Y	Periodic		
v. Verify anchor element type, material, diameter, and length	Field inspection	Y	Periodic		
vi. Verify adhesive identification and expiration date	Field inspection	Y	Periodic		
vii. Verify adhesive installation in accordance with the MPI	Field inspection	Y	Periodic		
5. Verify use of approved design mix	Shop[3] and field inspection	Y	Periodic		
6. Prior to placement, fabricate specimens for strength tests, perform slump and air content tests, determine the temperature of the concrete, and perform any other tests as specified in construction documents.	Shop[3] and field inspection	Y	Continuous		
7. Inspection of concrete and shotcrete placement for proper application techniques	Shop[3] and field inspection	Y	Continuous		
8. Verify maintenance of specified curing temperature and techniques	Shop[3] and field inspection	Y	Periodic		
9. Inspection of prestressed concrete:					
a. Application of prestressing forces	Shop[3] and field inspection	N	Continuous		
b. Grouting of bonded prestressing tendons	Shop[3] and field inspection	N	Continuous		
10. Inspect erection of precast concrete members					
a. Verify member locations and joint details comply with construction and erection documents	Field Inspection	N	Periodic		
b. Verify proper bearing pad type and placement	Field Inspection	N	Periodic		
c. Verify placement of grout (including hot and cold weather procedures and that maximum specified number of levels to be placed before grouting are not exceeded)	Field Inspection	N	Periodic		
d. Verify joint widths are within specified tolerance where joints are to receive sealant	Field Inspection	N	Periodic		
e. Verify thread engagement and torque for mechanical connections	Field Inspection	N	Periodic		
f. Verify tilt-up concrete wall panel connections to slab on grade and foundation comply with construction documents	Field Inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
11. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs	Review field testing and laboratory reports	Y	Periodic		
12. Inspection of formwork for shape, lines, location and dimensions of the concrete member being formed.	Field inspection	Y	Periodic		
a. Prior to each concrete placement, verify that a professional engineer who specializes in shoring design has inspected the shoring and reshoring for conformance with the shoring and reshoring plans	Verify	Y	Periodic		
13. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports	Y	Periodic		
1705.4 Masonry Construction					
MINIMUM VERIFICATION REQUIREMENTS					
(A) Level 1, 2 and 3 Quality Assurance:					
1. Prior to construction, verification of compliance of submittals	Submittal Review	N	Prior to Construction		
(B) Level 2 & 3 Quality Assurance:					
1. Prior to construction verification of f'm and f'_{AAC} except where specifically required by the code	Testing by unit strength method or prism test method	N	Prior to Construction		
2. During construction, verification of Slump Flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to project site.	Testing by unit strength method or prism test method	N	Periodic		
(C) Level 3 Quality Assurance:					
1. During construction, verification of f'm and f'_{AAC} for every 5,000 SF	Testing by unit strength method or prism test method	N	Periodic		
2. During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.	Field inspection	N	Periodic		
MINIMUM SPECIAL INSPECTION REQUIREMENTS					
(D) Levels 2 and 3 Quality Assurance:					
1. As masonry construction begins, verify that the following are in compliance:					
a. Proportions of the site-prepared mortar	Field inspection	N	Periodic		
b. Grade and size of prestressing tendons and anchorages	Field Inspection	N	Periodic		
c. Grade, type, and size of reinforcement, anchor bolts, and prestressing tendons and anchorages	Field Inspection	N	Periodic		
d. Prestressing technique	Field Inspection	N	Periodic		
e. Properties of thin-bed mortar for AAC masonry (b) Required for the first 5,000 square feet (c) Required after the first 5,000 square feet	Field Inspection	N	Level 2: Continuous[(b)] Level 2: Periodic[(c)]		
		N	Level 3: Continuous		
f. Sample panel construction	Field Inspection	N	Level 2: Periodic		
		N	Level 3: Continuous		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
2. Prior to grouting, verify that the following are in compliance:					
a. Grout space	Field Inspection	N	Level 2: Periodic		
		N	Level 3: Continuous		
b. Placement of prestressing tendons and anchorages	Field Inspection	N	Periodic		
c. Placement of reinforcement, connectors, and anchor bolts	Field inspection	N	Level 2: Periodic		
		N	Level 3: Continuous		
d. Proportions of site-prepared grout and prestresssing grout for bonded tendons	Field Inspection	N	Periodic		
3. Verify compliance of the following during construction:					
a. Materials and procedures with the approved submittals	Field inspection	N	Periodic		
b. Placement of masonry units and mortar joint construction	Field Inspection	N	Periodic		
c. Size and location of structural members	Field inspection	N	Periodic		
d. Type, size, location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	Field inspection	N	Level 2: Periodic		
		N	Level 3: Continuous		
e. Welding of reinforcement	Field inspection	N	Continuous		
f. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F)	Field inspection	N	Periodic		
g. Application and measurement of prestressing force	Field testing	N	Continuous		
h. Placement of grout and prestressing grout for bonded tendons is in compliance	Field inspection	N	Continuous		
i. Placement of AAC masonry units and construction of thin-bed mortar joints (b) Required for the first 5,000 square feet (c) Required after the first 5,000 square feet	Field inspection	N	Level 2: Continuous[(b)] Level 2: Periodic[©]		
		N	Level 3: Continuous		
4. Observe preparation of grout specimens, mortar specimens, and/or prisms	Field inspection	N	Level 2: Periodic		
		N	Level 3: Continuous		
5. Inspection of anchors post-installed in solid grouted masonry: Per research reports including verification of anchor type, anchor dimensions, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, masonry unit, grout, masonry compressive strength, anchor embedment and tightening torque	Field inspection	N	Periodic or as required by the research report issued by an approved source		
1705.5 Wood Construction					
1. For prefabricated wood structural elements, inspection of the fabrication process and assemblies in accordance with Section 1704.2.5.	In-plant review[3]	N	Periodic		
2. For high-load diaphragms, verify grade and thickness of structural panel sheathing agree with approved building plans.	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT**[1]	**DATE COMPLETED**
3. For high-load diaphragms, verify nominal size of framing members at adjoining panel edges, nail or staple diameter and length, number of fastener lines, and that spacing between fasteners in each line and at edge margins agree with approved building plans	Field inspection	N	Periodic		
4. Metal-plate-connected wood trusses:					
a. Verification that permanent individual truss member restraint/bracing has been installed in accordance with the approved truss submittal package when the truss height is greater than or equal to 60".	Field inspection	N	Periodic		
b. For trusses spanning 60 feet or greater: verify temporary and permanent restraint/bracing are installed in accordance with the approved truss submittal package	Field inspection	N	Periodic		
1705.6 Soils					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic		
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic		
3. Perform classification and testing of compacted fill materials.	Field inspection	Y	Periodic		
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous		
5. Prior to placement of controlled fill, inspect subgrade and verify that site has been prepared properly	Field inspection	Y	Periodic		
1705.7 Driven Deep Foundations					
1. Verify element materials, sizes and lengths comply with requirements	Field inspection		Continuous		
2. Determine capacities of test elements and conduct additional load tests, as required	Field inspection	N	Continuous		
3. Inspect driving operations and maintain complete and accurate records for each element	Field inspection	N	Continuous		
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	Field inspection	N	Continuous		
5. For steel elements, perform additional inspections per Section 1705.2	See Section 1705.2	N	See Section 1705.2		
6. For concrete elements and concrete-filled elements, perform tests and additional inspections per Section 1705.3	See Section 1705.3	N	See Section 1705.3		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge	Field inspection	N	In accordance with construction documents		
8. Perform additional inspections and tests in accordance with the construction documents	Field inspection and Testing	N	In accordance with construction documents		
1705.8 Cast-in-Place Deep Foundations					
1.Inspect drilling operations and maintain complete and accurate records for each element	Field inspection	N	Continuous		
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes	Field inspection	N	Continuous		
3. For concrete elements, perform tests and additional inspections in accordance with Section 1705.3	See Section 1705.3	N	See Section 1705.3		
4. Perform additional inspections and tests in accordance with the construction documents	Field inspection and Testing	N	In accordance with construction documents		
1705.9 Helical Pile Foundations					
1. Verify installation equipment, pile dimensions, tip elevations, final depth, final installation torque and other installation data as required by construction documents.	Field inspection	N	Continuous		
2. Perform additional inspections and tests in accordance with the construction documents	Field inspection and Testing	N	In accordance with construction documents		
1705.10 Fabricated items					
1. List of fabricated items requiring special inspection during fabrication:	Shop inspection		As noted in each applicable shop activity		
2. List of fabricated items to be fabricated on the premises of a fabricator approved to perform such work without special inspection (including name of approved agency providing periodic auditing):					
1705.11.1 Structural Wood Special Inspections For Wind Resistance					
1. Inspection of field gluing operations of elements of the main windforce-resisting system	Field inspection	N	Continuous		
2. Inspection of nailing, bolting, anchoring and other fastening of components within the main windforce-resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs.	Shop[3] and field inspection	N	Periodic		
1705.11.2 Cold-formed Steel Special Inspections For Wind Resistance					
1.Inspection during welding operations of elements of the main windforce-resisting system	Shop[3] and field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
2. Inspection of screw attachment, bolting, anchoring and other fastening of components within the main windforce-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.	Shop[3] and field inspection	N	Periodic		
1705.11.3 Wind-resisting Components					
1. Roof covering, roof deck and roof framing connections.	Shop[3] and field inspection	N	Periodic		
2. Exterior wall covering and wall connections to roof and floor diaphragms.	Shop[3] and field inspection	N	Periodic		
1705.12.1 Structural Steel Special Inspections for Seismic Resistance					
1. Seismic force-resisting systems in SDC B, C, D, E, or F.	Shop[3] and field inspection	N	In accordance with AISC 341		
2. Structural steel elements in SDC B, C, D, E, or F other than those in Item 1. including struts, collectors, chords and foundation elements.	Shop[3] and field inspection	N	In accordance with AISC 341		
1705.12.2 Structural Wood Special Inspections for Seismic Resistance					
1. Field gluing operations of elements of the seismic-force resisting system for SDC C, D, E or F.	Field inspection	N	Continuous		
2. Nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system including wood shear walls, wood diaphragms, drag struts, shear panels and hold-downs for SDC C, D, E or F.	Shop[3] and field inspection	N	Periodic		
1705.12.3 Cold-formed Steel Light-Frame Construction Special Inspections for Seismic Resistance					
1. During welding operations of elements of the seismic-force-resisting system for SDC C, D, E or F.	Shop[3] and field inspection	N	Periodic		
2. Screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs for SDC C, D, E or F.	Shop[3] and field inspection	N	Periodic		
1705.12.4 Designated Seismic Systems Verification Special Inspections for Seismic Resistance					
For SDC C, D, E or F, inspect and verify that that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with ASCE 7 Section 13.2.2.	Field inspection	Y/N	Periodic		
1705.12.5 Architectural Components Special Inspections for Seismic Resistance					
1. For SDC D, E or F, inspection during the erection and fastening of exterior cladding and interior or exterior veneer more than 30 feet above grade or walking surface and weighing more than 5 psf.	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
2. For SDC D, E or F, inspection during the erection and fastening of interior nonbearing walls more than 30 feet above grade or walking surface and weighing more than 15 psf.	Field inspection	X	Periodic		
3. For SDC D, E or F, inspection during the erection and fastening of exterior nonbearing walls more than 30 feet above grade or walking surface.	Field inspection	Y			
4. For SDC D, E or F, inspection during anchorage of access floors	Field inspection	X	Periodic		
1705.12.6 Plumbing, Mechanical and Electrical Components Special Inspections for Seismic Resistance					
1. Inspection during the anchorage of electrical equipment for emergency or standby power systems in SDC C, D, E or F	Field inspection	Y/N	Periodic		
2. Inspection during the anchorage of other electrical equipment in SDC E or F	Field inspection	Y/N	Periodic		
3. Inspection during installation and anchorage of piping systems designed to carry hazardous materials, and their associated mechanical units in SDC C, D, E or F	Field inspection	Y/N	Periodic		
4. Inspection during the installation and anchorage of HVAC ductwork designed to contain hazardous materials in SDC C, D, E or F	Field inspection	Y/N	Periodic		
5. Inspection during the installation and anchorage of vibration isolation systems in SDC C, D, E or F where nominal clearance of 1/4 inch or less is required by the approved construction documents	Field inspection	Y/N	Periodic		
6. Inspection during installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed in structures assigned to SDC C, D, E, or F to verify one of the following unless flexible sprinkler hose fittings are used:					
a. ASCE/SEI 7, Section 13.2.3 minimum required clearances have been provided.	Field inspection	Y/N	Periodic		
b. A three inch or greater nominal clearance has been provided between fire protection sprinkler system drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the building structure; and other systems' piping.	Field inspection	Y/N	Periodic		
1705.12.7 Storage Racks Special Inspections for Seismic Resistance					
Inspection during the anchorage of storage racks 8 feet or greater in height in structures assigned to SDC D, E or F.	Field inspection	N	Periodic		

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)					
PROJECT	**Briscoe Park Recreation Center**				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT[1]**	**DATE COMPLETED**
1705.12.8 Seismic Isolation Systems					
Inspection during the fabrication and installation of isolator units and energy dissipation devices used as part of the seismic isolation system in structures assigned to SDC B, C, D, E or F.	Shop and field inspection	N	Periodic		
1705.12.9 Cold-formed Steel Special Bolted Moment Frames					
Inspection of installation of cold-formed steel special bolted moment frames in the seismic force-resisting systems in structures assigned to SDC D, E or F.	Field inspection	N	Periodic		
1705.13.1 Structural Steel Testing for Seismic Resistance					
1. Nondestructive testing of structural steel in the seismic force-resisting systems in accordance with AISC 341 in structures assigned to SDC B, C, D, E or F.	Field test	N	Periodic		
2. Nondestructive testing of structural steel elements in the seismic force-resisting systems not covered in 1 above including struts, collectors, chords and foundation elements in accordance with AISC 341 in structures assigned to SDC B, C, D, E or F.	Field test	N	Periodic		
1705.13.2 Seismic Certification of Nonstructural Components					
Review certificate of compliance for nonstructural components components in structures assigned to SDC B, C, D, E or F.	Certificate of compliance review	Y/N	Each submittal		
1705.13.3 Seismic Certification of Designated Seismic Systems					
Review certificate of compliance for designated seismic system components in structures assigned to SDC C, D, E or F	Certificate of compliance review	Y/N	Each submittal		
1705.13.4 Seismic Isolation Systems					
Test seismic isolation system in accordance with ASCE 7 Section 17.8 in structures assigned to SDC B, C, D, E or F.	Prototype testing	N	Per ASCE 7		
1705.14 Sprayed Fire-resistant Materials					
1. Verify surface condition preparation of structural members	Field inspection	N	Periodic		
2. Verify minimum thickness of sprayed fire-resistant materials applied to structural members	Field inspection	W	Periodic		
3. Verify density of the sprayed fire-resistant material complies with approved fire-resistant design	Field inspection and testing	W	Per IBC Section 1705.14.5		
4. Verify the cohesive/adhesive bond strength of the cured sprayed fire-resistant material	Field inspection and testing	W	Per IBC Section 1705.14.6		
5. Condition of finished application	Field inspection	W	Periodic		
1705.15 Mastic and Intumescent Fire-Resistant Coatings					
Inspect and test mastic and intumescent fire-resistant coatings applied to structural elements and decks per AWCI 12-B	Field inspection and testing	W	Periodic		
1705.16 Exterior Insulation and Finish Systems (EIFS)					

SCHEDULE OF SPECIAL INSPECTIONS SERVICES (IBC 2018: Chapter 17)

PROJECT	Briscoe Park Recreation Center				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT[1]	DATE COMPLETED
Inspection of water-resistive barrier over sheathing substrate	Field inspection	W	Periodic		
1705.17 Fire-Resistant Penetrations and Joints					
1. Inspect penetration firestop systems	Field testing	X	Per ASTM E2174		
2. Inspect fire-resistant joint systems	Field testing	Y	Per ASTM E2393		
1705.18 Smoke Control Systems					
1. Leakage testing and recording of device locations prior to concealment	Field testing	N	Periodic		
2. Prior to occupancy and after sufficient completion, pressure difference testing, flow measurements, and detection and control verification	Field testing	N	Periodic		

INSPECTION AGENTS[2] FIRM	ADDRESS	TELEPHONE NO.
1.		
2.		
3.		
4.		

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies may be subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

3. Shop Inspections of fabricated items are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.1 and listed in activity 1709.2.

4. Observe: Observe on a random basis, operations need not be delayed pending these inspections. Perform: These tasks shall be performed for each welded joint, bolted connection, or steel element.

5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360, N6.

6. Special inspections shall be in accordnace with the research report issued for the specific anchor, but not less than specified in this section and the Contract Documents.

7. Proof load testing is required at 10% (but not less than two) of all post installed adhesive anchors. Testing shall be performed per the proof loading requirements of ACI 355.4-11 Section 13.3.4. These anchors shall be selected at random by the special inspector. Where 100% of anchors do not pass tests, a further 50% of all installed anchors shall be tested. Adhesive anchors not requiring proof testing shall be explicitly denoted in the Construction Documents.

Are *Special Inspections for Seismic Resistance* included in the *Statement of Special Inspections* ? **Yes**

Are *Special Inspections for Wind Resistance* included in the *Statement of Special Inspections* ? **No**

DATE: 12/5/2024

FINAL REPORT OF SPECIAL INSPECTIONS

PROJECT: _____

LOCATION: _____

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

_____

ARCHITECT OF RECORD: _____

STRUCTURAL ENGINEER OF RECORD: _____

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: _____

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered___to___form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

_____

_____

_____

_____

_____

(Attach 8 ½"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

_____
Special Inspection Agent/Firm

_____
Type or print name

_____
Signature Date

Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind or seismic force-resisting system, designated seismic system or wind or seismic-resisting component listed in the Statement of Special Inspections, Special Inspections for Seismic or Wind Resistance, must submit a Statement of Responsibility.

Project: _____

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

_____
_____
_____
_____
_____
_____
_____

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to obtain conformance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.1 of the International Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: _____

Fabricator's Name: _____

Address: _____

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

SECTION 014200

REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 DEFINITIONS:

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Architect," "requested by the Architect," and similar phrases.

D. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, temporary storage, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer:

1. An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

2. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

3. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project.

1. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land on which the Project is to be built.

2. If areas available are not indicated, they will be as mutually agreed by Owner and Contractor at Preconstruction Conference and as modified during construction.

K. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 2004 MASTERFORMAT numbering system with 49-Division format.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language:
   a. Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate.
   b. Words that are implied, but not stated shall be interpolated as the sense required.
   c. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1.4 INDUSTRY STANDARDS:

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements:

1. Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.

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

D. Copies of Standards:

1. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

2. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

1.5 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 are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., seventh edition.

B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.6 SUBMITTALS:

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records

established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS: (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000
TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 TEMPORARY FACILITIES:

A. Proper provision shall be made for storage of bulk materials, parking of construction vehicles and direct access to the building site as acceptable to the Owner and approved by the Architect.

B. Site Parking: On-site parking will be available to the Contractor with the "staging areas" indicated, or if not indicated, as agreed to and designated by the Owner.

C. Field Offices: Provide temporary field offices of sufficient size to accommodate Contractor's requirements at the project site. Furnish and equip offices with not less than the following:
1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings, equipped with table and chairs.
3. Private toilet facility with water closet, lavatory and medicine cabinet with mirror.
4. Drinking water and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor habitable temperature.
6. Lighting fixtures capable of maintaining average illumination of 20 foot-candles at desk height
7. Digital camera having no less than 5 megapixels resolution, with 5× zoom, for daily construction documentation at the site, including flash, memory cards, charger and rechargeable batteries, standard batteries as back-up or for primary use, and all standard accessories and hardware for equipment, for complete and proper operation, and for downloading and emailing.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations as required.

1.3 TOILET FACILITIES:

A. Contractor shall provide temporary toilet facilities on site for the duration of the project, for construction personnel use. They shall be enclosed weatherproof and sanitary toilets.

1. Maintain toilets in sanitary condition at all times. Remove outside toilets when no longer required, and leave site in clean condition.

2. Conform to local ordinances and regulations.

B. Toilet facilities in the Owner's buildings are not available to, and shall not be used by, the Contractor, subcontractors, and construction personnel.

1.4 TEMPORARY TELEPHONES:

A. Provide telephone for Contractor and Architect in the Contractor's job office at the project site, or if no on-site office is provided, provide a portable or cellular telephone to the Contractor's Superintendent. Cost of service and local calls shall be paid by General Contractor. Long distance and toll calls shall be paid by the party making such calls.

B. Provide telephone answering machine or service (or "voice mail" for cellular phone), to facilitate communication with the Contractor's superintendent.

1.5 TEMPORARY BARRIERS AND FENCES:

A. Contractor shall provide and maintain adequate fencing, barricades and protective walkways where required to provide suitable protection for employees, children, and the public at all times until completion of the work, acceptable to authorities having jurisdiction.

B. The Contractor shall confine the activities of work on this project to within the protected areas, unless otherwise directed by the Architect or Owner.

1.6 ELECTRIC POWER SERVICE:

A. Provide temporary electrical service, including extensions and connections required for construction work.

1. Contractor shall pay electric-power-service use charges for electricity used by all entities for construction operations, including costs of installing and maintaining service for duration of project.

2. Contractor shall also pay costs associated with use of permanent electrical system when operational until Date of Substantial Completion.

B. The Contractor shall be responsible for all extensions, connections and associated servicing items as necessary for the Work. Contractor shall remove all temporary wiring, extensions, connections and related items, prior to Substantial Completion.

C. The Contractor shall protect the Owner's systems from outage or damage, and repair of any damage to at least its previously existing condition - subject to the Owner's approval.

1.7 WATER AND SEWER SERVICES:

A. Provide temporary water and sewer service for construction purposes, including extensions and connections required.

1. Contractor shall pay water and sewer service use charges for usage by all entities for construction operations, including costs of installing and maintaining service for duration of project.

2. Contractor shall also pay costs associated with use of permanent water system when operational until Date of Substantial Completion.

B. The Contractor shall provide temporary stub-up, hose bib and connections as necessary for the Work. Contractor shall remove all temporary piping, valves, and associated connections prior to substantial completion.

C. The Contractor shall protect the Owner's water and sewer systems, new and temporary water lines, valves, and related connections from freezing, damage and contamination, and repair of any damage to the Owner's water systems to at least its previously existing condition - subject to the Owner's approval.

D. Contractor shall be responsible for any and all costs associated with the procurement and installation of any new meters, including all fees for service connection, permits, tap fees, and impact fees. The cost shall be included in the Contract amount as part of the Work.

1.8 TEMPORARY HEAT AND VENTILATION:

A. Contractor shall furnish temporary heat as required for uninterrupted construction and other operations, protection of new work, for drying out buildings, curing of materials and controlling humidity in enclosed spaces where required.

1. Provide temporary heating in enclosed spaces to provide minimum temperatures of 40-deg. F. until time finishing work begins.

2. After building is totally enclosed and installation of finishes begins, maintain spaces in a temperature range of 60-deg. F. to 80-deg. F. at all times, except as may otherwise be required by product manufacturers for proper product installation and performance. Maintain until Date of Substantial Completion

B. Provide ventilation to prevent accumulation of dust, fumes or gases and to properly cure materials and disperse humidity.

1.9 ENCLOSURES AND PROTECTION:

A. Provide and maintain for the duration of construction of scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges and other temporary construction necessary for proper completion and observation of the work, in compliance with pertinent safety and other regulations, and authorities having jurisdiction.

1.10 PROJECT SIGNS:

A. Provide one project sign installed at locations on job site as directed by Architect.

1. Construct signs using 3/4- thickness, APA Medium Density Overlay, EXT, plywood; approximate size of 8-ft. by 12-ft., painted in not more than three colors.

2. Support signs with 4-inch by 4-inch wood posts set in ground. Provide additional bracing and framing for rigid installation.

3. Coordinate sign design with Architect.

B. Provide temporary, directional signs for construction personnel and visitors.

C. Protect installed signs from construction damage for duration of project.

1.11 CLEAN UP:

A. The Contractor or his agent, upon completion of the work shall immediately remove all temporary fences, temporary utility lines, debris or any other obstructions and leave such property in as good a condition as it was before such work was commenced.

B. The Contractor, upon completion of the work, shall remove all other temporary structures and facilities from the site.

C. The Contractor shall legally dispose of all trash, debris, and waste off site, on a regular basis.

D. Items salvaged by Contractor for his own purposes or for the Owner where indicated, may be stored temporarily on site and removed as soon as possible, unless directed otherwise by Architect, or Owner.

E. The sale or advertising for sale of salvaged or other materials shall not be permitted on site under any circumstances.

F. Control dust on site and clean mud and/or debris from on site and city streets and sidewalks, as it occurs.

G. Provide facilities to wash mud off of truck tires, equipment and construction vehicles before it can be tracked onto streets, roads or public thoroughfares.

END OF SECTION 015000

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

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

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design" including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
   1. The Architect shall be the sole judge in determining the acceptability of the product submitted to be comparable to the one specified as the Basis of Design.
   2. Should product submitted be determined by the Architect as not comparable to the Basis of Design, Contractor shall be responsible for providing the specified Basis of Design product without additional cost.

C. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

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

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.

b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

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

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Submittal Time: Comply with requirements in Division 1 Section "Project Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers.

a. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
b. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample.
1. Architect's decision will be final on whether a proposed product matches.
2. If no product is available within specified category matches and complies with other specified requirements, comply with requirements in "Product Substitution" Article for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Requests for substitution shall reach the Architect not less than ten (10) calendar days prior to the date set for Bid opening. Requests received by Architect after this date will not be considered.

B. Architect will consider Contractor's request for substitution in accordance with conditions and procedures described in the Instructions to Bidders.

C. Conditions for Consideration: Architect will consider Contractor's request for substitution when the following conditions are satisfied.
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include

compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

D. Architect will determine acceptability of proposed substitutions. In accepting a substitution the Architect does not warrant that the product meets all expressed requirements of the Contract Documents. The approved substitution is subject to the same subsequent review and approval procedures as the products originally specified.

1. Determination as to acceptability of proposed substitutions will be made based only on data submitted.
2. Substitute products shall not be ordered or installed without written acceptance by the Architect.

E. Contractor shall coordinate installation of accepted substitutions with interfacing work, bearing re-design costs and making approved changes in the Work to properly incorporate the substitutions, and shall waive all claims for additional costs related to use of acceptable substitutions which become apparent following acceptance.

2.3 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017329
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definition:
1. 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 condition.
2. Cutting and patching is performed for coordination of the Work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
3. 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".

1.3 SUBMITTALS:

A. Procedural Proposal for Cutting and Patching:
1. Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as application, in the submittal.
2. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.
3. List products to be used and firms that will perform work.
4. Give dates when work is expected to be performed.
5. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that work be out-of-service temporarily. Indicate how long utility service will be disrupted.
6. Approval by the Architect/Engineer to proceed with cutting and patching work does not waive the Architect/Engineer's right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Except as otherwise indicated, or as directed by the Architect/Engineer, use materials for cutting and patching that are identical to specified materials. If identical materials are not available, or cannot be used, use materials that match adjacent surfaces to the fullest extent possible with regard to visual effect.
   1. Use materials for cutting and patching that will result in equal-or-better performance characteristics.
   2. Comply with applicable specification sections for type of work to be performed.

PART 3- EXECUTION

3.1 INSPECTION:

A. Before cutting, 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.

3.2 PREPARATION:

A. Temporary Support: To prevent failure provide temporary support of work to be cut.

B. Protection:
   1. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
   2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
   3. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.3 PERFORMANCE:

A. General: Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect/Engineer, proceed with cutting and patching at the earliest feasible time and complete work without delay.

B. Cutting:
   1. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.
   2. 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 a 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.

C. Patching:

1. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
2. Where feasible, inspect and test patched areas to demonstrate integrity of work.
3. 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.
4. 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 coat.
5. Patch, repair or rehang existing ceilings as necessary or called for on plans to provide an even plane surface of uniform appearance.

3.4 CLEANING:

A. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely point, mortar, oils, putty and items of similar nature.

B. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 017329

SECTION 017720
PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions:

1. Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.

2. Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 33.

3. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates, if the Work is to be completed in phases. This time variation, if any, shall be applicable to the other provisions of this section.

1.3 PREREQUISITES TO SUBSTANTIAL COMPLETION:

A. General: Complete the following before requesting the Architect/Engineer's inspection for certification of substantial completion, either for the entire Work or for portions of the Work, if the Work is to be completed in phases. List known exceptions in the request.

1. Inspection Procedures:
   a. The Contractor shall conduct their own complete Prefinal Inspections, distribute punch-lists to all trades, the Owner, Architect and their Consultants, and complete all resulting work items, prior to any Final Inspection by the Architect or their Consultants.
   b. Following the Contractor's completion of work resulting from their own inspection(s), and upon receipt of the Contractor's request for inspection, the Architect/Engineer will either proceed with inspection or advise the Contractor of unfilled prerequisites.
   c. Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed before the certificate will be issued. The Architect/Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed.

d. Results of the completed inspection will form the initial “punch-list” for “final acceptance”.

2. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as “substantially complete”, or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.

3. Submit a statement showing an accounting of changes to the Contract Sum.

4. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.

5. Obtain and submit releases enabling the Owner’s unrestricted use of the Work and access to services and utilities. Where required, include occupancy permits, operating certificates, and other similar releases.

6. Deliver tools, spare parts, extra stock of material, and similar physical items to the Owner.

7. Make the final change-over of locks and transmit the keys to the Owner. Advise the Owner’s personnel of the change-over in security provisions.

8. Complete start-up testing of systems, and instruction of the Owner’s operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups, and similar elements.

1.4 PREREQUISITES TO FINAL ACCEPTANCE:

A. General: Complete the following before requesting the Architect/Engineer’s final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.

1. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

3. Submit a certified copy of the Architect/Engineer’s final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and which has been endorsed and dated by the Architect/ Engineer.

4. Submit final meter readings for utilities, a measured record of stored fuel, and similar date either as of the date of substantial completion, or else when the Owner or subsequent Contractor took possession of and responsibility for corresponding elements of the Work.

5. Submit consent of surety.

6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Include supporting documentation for completion as indicated in these contract documents.

B. Re-inspection Procedure:

1. The Architect/Engineer will re-inspect the Work upon receipt of the Contractor's notice that the Work, including punch-list items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.

2. Upon completion of re-inspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.

3. If necessary, the re-inspection procedure will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS:

A. Time of Submittal: Submit project record documents within ten (10) days of acceptance of the entire completed project.

B. Record Drawings and Project Manual: Submit record drawings and project manuals with specifications according to requirements specified in Division 01 Section "Project Record Documents." Include in set mechanical, plumbing, fire protection and electrical record drawings and specifications. Obtain Architect's review and acceptance of documents prior to submittal.

1. Originals: Submit one original marked-up set. Original documents shall include recorded colored markings as specified in Project Record Documents section and maintained throughout construction.

2. Digital Copies: Submit two (2) digital copies in latest edition of ISO/Adobe compliant "Portable Document Format" (PDF) saved as "Read Only" on compact discs (CD's), clearly and permanently labeled as to their contents. Minimum Resolution shall be 300 dpi for small format documents and 600 dpi for large format documents ("large format" is defined as larger than 11-inches by 17-inches).
   a. Original documents shall be scanned and saved in color. Documents may be saved in a non-proprietary ISO compliant self-extracting compressed file format, and no documents shall be password protected.
   b. Deliver digital copies in standard CD cases or sleeves which are free of any PVC content. Clearly and permanently label cases and disks with contents.

C. Record Samples Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect/Engineer and the Owner's personnel, if desired, to determine which, if any, of the submitted samples that have been maintained by the Contractor during progress of the Work, are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's designated storage area for samples.

D. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect/Engineer for the Owner's records.

E. Maintenance Manuals, Warranties, and Guarantees:

1. Unless indicated otherwise, submit one (1) original and one (1) copy of each item required by the Project Manual.

2. Furnish to Architect for review, and then to Owner, in two (2) separate sets bound in three-ring binders, permanently and clearly identifying the project and contents on front and edge.

PART 2 – PRODUCTS

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

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING:

A. General Operating and Maintenance Instructions:

1. Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives.

2. As part of this instruction, provide a detailed review of the following items:
   a. Maintenance manuals
   b. Record documents
   c. Spare parts and materials
   d. Tools
   e. Identification systems
   f. Control sequences
   g. Cleaning procedures
   h. Warranties, bonds, maintenance agreements, and similar continuing commitments.

3. As a part of this instruction for operating equipment, demonstrate the following procedures:
   a. Start-up
   b. Shut-down
   c. Emergency operations
   d. Noise and vibration adjustments

e. Safety procedures
f. Economy and efficiency adjustments
g. Effective energy utilization.

3.2 FINAL CLEANING:

A. General: Special cleaning requirements for specific units of Work are included in the appropriate sections of Divisions 2 through 16. General Cleaning during the regular progress of the Work is required by the General Conditions and is included under section "Temporary Facilities".

B. Cleaning: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.

C. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completion:

1. Clean the project site, including landscape development areas, of rubbish, litter and other foreign substances.

2. Sweep paved areas to a broom clean condition; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

D. Removal of Protection: Except as otherwise indicated or requested by the Architect/Engineer, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

E. Compliance:

1. Comply with safety standards and governing regulations for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.

2. Do not burn waste materials at the site.

3. Do not bury debris or excess materials on the Owner's property.

4. Do not discharge volatile or other harmful or dangerous materials into drainage systems.

5. Where extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these materials to the Owner's best advantage as directed.

END OF SECTION 017720

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous Record Documents.

B. Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various “submittals” sections.

C. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistant location; provide access to record documents for the Architect/Engineer’s reference during normal working hours.

1.3 PROJECT RECORD DOCUMENTS:

A. Maintain at least one (1) copy of all drawings, specifications, addenda, approved shop drawings, change orders, filed orders, other contract modifications and other reviewed documents submitted by the Contractor in compliance with various sections of the specifications.

1. Project record documents shall be clearly marked "Project Record Copy," maintained in good condition, available for inspection by the Architect or Owner, and not used for construction purposes.
2. Keep project record documents current. Do not permanently conceal any work until the required information has been recorded.

B. Record Drawings: Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition.

1. Mark-up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown.
   a. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for

mark-up, record a cross-reference at the corresponding location on the contract drawings.

b. Give particular attention to concealed work that would be difficult to measure and record at a later date.

2. Mark drawings to include, but not limited to, the following types of items:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations.
   d. Locations and depths of underground utilities and appurtenances. Locate utilities and appurtenances, referenced to permanent surface improvements by dimensions and descriptions.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Significant details not shown in the original contract documents.

3. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.

4. Mark-up new information which is known to be important to the Owner, but for same reason was not shown on either contract drawings or shop drawings.

5. Note related change-order numbers where applicable.

6. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Record Project Manual: Maintain one complete copy of the Project Manual, including specifications and addenda(s), and one copy of other written construction documents such as change orders and similar modifications issued during construction.

1. Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   c. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   d. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.

2. Note related Change Orders, record Product Data, and record Drawings where applicable.

D. Record Product Data: Maintain an annotated PDF electronic file record set of final reviewed product data bearing Architect's submittal review stamp. Include with the record

set a directory identifying each submittal electronically linked to each item of the record product data.

1. Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in product data submittal.
   a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   b. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
2. Organize record set of product data, including directory, by specification section number and title.

E. Miscellaneous Record Submittals: Maintain and assemble PDF electronic file of miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Include a directory identifying each submittal electronically linked to each item of the miscellaneous records.

1. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.
2. Categories of requirements resulting in miscellaneous records include, but are not limited to, the following:
   a. Field records on excavations and foundations.
   b. Field records on underground construction and similar work.
   c. Survey showing locations and elevations of underground lines.
   d. Invert elevations of drainage piping.
   e. Surveys establishing building lines and levels.
   f. Authorized measurements utilizing unit prices or allowances.
   g. Records of plant treatment.
   h. Ambient and substrate condition tests.
   i. Certifications received in lieu of labels on bulk products.
   j. Batch mixing and bulk delivery records.
   k. Testing and qualification of tradesmen.
   l. Documented qualification of installation firms.
   m. Load and performance testing.
   n. Inspections and certifications by governing authorities.
   o. Leakage and water-penetration tests.
   p. Fire-resistance and flame-spread test results.
   q. Final inspection and correction procedures.
3. Organize miscellaneous records, including directory, by specification section number and title.

PART 2 – PRODUCTS
(NOT USED)

PART 3 - EXECUTION

3.1 RECORDING AND MAINTAINING PROJECT DOCUMENTS:

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes.

1. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss.

2. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

A. Definitions:

1. Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.

2. Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 33.

3. Time of closeout is directly related to “Substantial Completion”; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates, if the Work is to be completed in phases. This time variation, if any, shall be applicable to the other provisions of this section.

1.1 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.2 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.3 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.4 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.

d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.5 PREPARATION

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

B. Set up instructional equipment at instruction location.

1.6 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written and a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.7 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.

1. Submit video recordings thumb drive by loading to web-based Project software site.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 020613

GEOTECHNICAL DATA REPORT

PART 1 - GENERAL

1.1 DOCUMENTS:

The owner has procured a Geotechnical Report for the Snellville Briscoe Park Community Recreation Center project site. A copy of this report will be made available upon request. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Description:

1. This section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

a. Footings.

b. Foundation Walls.

c. Site Retaining Walls.

d. Slabs-On-Grade.

e. Concrete Toppings.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.

2. All cast-in-place concrete work on this project shall conform to the Construction Documents, applicable building code including referenced standards, the requirements of “Specification for Structural Concrete” ACI 301-16 (Chapters 1-5, & Chapters 6-14 as applicable) and "Specifications for Tolerances for Concrete Construction and Materials" ACI 117, in coordination with clarifications, exemptions, and additions in the Construction Documents.

C. Related Sections:

1. Division 03 Specifications – Concrete Construction.

2. Division 07 Specifications – Thermal and Moisture Protection.

3. Division 31 Specifications – Earthwork.

1.3 QUALITY ASSURANCE

A. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.

2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.4 SUBMITTALS

A. Design Mixtures:

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

B. Cold-Weather Placement: Submit detailed procedures for cold weather concreting in accordance with ACI 306.1.

C. Hot-Weather Placement: Submit detailed procedures for hot weather concreting in accordance with ACI 305.1.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Formwork layout and dimension shop drawings.

F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates

G. Material Certificates: For each of the following as applicable on the project, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

H. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

I. Minutes of preinstallation conference.

1.5 INFORMATION SUBMITTALS

A. Formwork Shop Drawings: Signed and sealed by a Licensed Design Engineer in the state in which the project is located.

1. Calculations for Formwork, Shoring, Reshoring, and Backshoring: Signed and sealed by a Licensed Design Engineer in the state in which the project is located.

B. Embed and Penetration Plans: Submit placing drawings that detail locations of mechanical, electrical, plumbing, and fire protection openings, sleeves and embedded accessories not specifically located on the Structural Construction Drawings, including routing of embedded conduit.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Comply with ACI 301.

B. Earth forms may be used for footing forms where sides of the excavation are cut true, in firm soil. If earth is not suitable to be used as "earth form," no consideration will be given to any claim for additional cost of formwork. Contractor shall provide material and labor to provide formwork without additional cost to Owner.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615 Grade 60 deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706 Grade 60 deformed.

1. For use where weldable reinforcing is called out in construction documents.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Manufacture bar supports from plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete for use in foundations and slabs-on-grade only.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.

b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

c. Use of supplemental cementitious materials may be rejected by Architect/Structural Engineer of Record for certain applications on project.

2. Blended Hydraulic Cement: ASTM C 595, Type IS portland blast-furnace slag, Type IP portland-pozzolan, Type I (PM) pozzolan-modified Portland, Type I (SM) slag-modified portland cement. Use of blended hydraulic cement may be rejected by Architect/Structural Engineer of Record for certain applications on project.

B. Silica Fume: ASTM C 1240, amorphous silica. Use of blended hydraulic cement may be rejected by Architect/Structural Engineer of Record for certain applications on project.

C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Select grading class per type of construction or location used, and in relation to specific weathering region. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: See schedule on Construction Drawings.

D. Water: Shall be potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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.

2.6 FIBER REINFORCEMENT

A. Fiber reinforcement may be requested for substitution by contractor. Architect/Structural Engineer of Record shall review for compliance any substitution requested and approve or reject as necessary.

2.7 WATERSTOPS

A. Coordinate with Division 07 specifications and architectural drawings for waterstop requirements.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder meeting ASTM E 1745, minimum 10 mil thickness. Coordinate with Division 03 and 07 specifications and Architectural Drawings for additional requirements or increased thickness. See Construction Drawings for locations required. Install per qualified geotechnical engineer's recommendation and ACI 302.1 requirements.

2.9 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 and ACI 318 chapter 5. Design mixtures shall meet the minimum requirements tabulated in the construction documents.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed. Requirements of table 4.1.2.9 of ACI 301 shall be adhered to.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, plasticizing, or retarding admixtures in concrete, as required, for placement and workability, and project specific conditions.

2.10 FABRICATING REINFORCEMENT

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

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete:

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

A. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for exposed smooth-formed finished surfaces.

2. Class B, 1/4 inch for exposed rough-formed finished surfaces.

3.2 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Field bending or straightening of reinforcing bars partially embedded in concrete is prohibited unless specifically permitted by Structural Engineer of Record. Comply with ACI 301 procedures for field bending and straightening.

C. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two full panels. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.3 CONCRETE PLACEMENT

A. Do not add water to concrete during delivery or at Project site. Add water at project site only as noted on delivery ticket, and prior to beginning placement.

B. Cold-Weather Placement: Comply additionally with ACI 306.1 and as follows:

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

C. Hot-Weather Placement: Comply additionally with ACI 305.1 and as follows:

1. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.

3.4 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish (after applying float finish):

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

D. Trowel and Fine-Broom Finish:

1. Apply a trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method.

2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

1. Coordinate required final finish with Architect before application.

3.5 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301, ACI 305, ACI 306, and ACI 306.1 as applicable.

B. Cure concrete according to ACI 308.1, by one or a combination of the methods allowed in ACI 301.

3.6 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect/Structural Engineer of Record. Remove and replace concrete that cannot be repaired and patched to Architect/Structural Engineer of Record approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning per ACI 301, to the satisfaction of the Architect/Structural Engineer of Record.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. For areas out of tolerance or specification, Contractor shall propose correction method to Architect/Structural Engineer of Record for approval.

3.7 FIELD QUALITY CONTROL

A. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample set for each 75 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

4. Air Content: ASTM C231 or ASTM C173 as applicable, one test for each composite sample, but not less than one test for each day’s pour of each concrete mixture.

5. Compression Test Specimens: ASTM C 31.

    a. Cast and cure a minimum of four 6”x12” or five 4”x8” cylinder specimens for each composite sample.

    b. Additional cylinders to be cast for high-early strength concrete and as required for contractor’s means and methods.

6. Compressive-Strength Tests: ASTM C 39; test one specimen at 7 days and one set of two (6”x12”)/three (4”x8”) specimens at 28 days. Should 28 day strength not be met, test remaining cylinder at 56 days. Should 28 day strength be met, remaining cylinder may be discarded. Additional tests for high-early strength concrete and as required for contractor’s means and methods.

B. Measure floor and slab flatness and levelness according to ASTM E 1155 as soon as possible but within 24 hours of finishing. Elevated framing shall be measured in its shored condition (where applicable).

END OF SECTION 033000

SECTION 03 3660
SEALED CONCRETE FLOOR

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Floors denoted on Finish Schedule as SC (Sealed Concrete).
   2. Furnish all labor, materials, equipment and services necessary for grinding and sealing concrete floors.
   3. PROTECTION OF CONCRETE SLABS DURING CONSTRUCTION.

1.02 RELATED SECTIONS

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

B. Section 03 3000 - Cast-in-Place Concrete: Concrete materials, placing, and finishing.

C. Section 03 3010 - Cast-in-Place Concrete for Exposed Concrete Floors.

D. Section 03 3680 - Concrete Polishing.

1.03 SUBMITTALS

A. Contractor shall submit specified manufacturer's complete technical data sheets for all products to be used, including installation instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of specified sealer shall have a minimum TEN (10) years experience in the production of the specified products.

B. Contractor Qualifications: Contractor must have a minimum FIVE (5) years experience in sealing applications and successfully completed not less than SIX (6) projects comparable in scale and complexity.

C. Regulatory Requirements
   1. Products shall comply with the United States Clean Air Act for maximum Volatile Organic Compound (VOC) content as specified in PART 2 of this section.

D. Mockups and Field Samples: Prepare field sample at project site for architects review and approval.
   1. Samples shall be constructed on site and shall be 4'x4'. If there is existing concrete, the Architect shall select an area where the samples will be placed.
   2. Construct sample-using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control, construction, and expansion joints in sample panels.
   3. Sample shall be sealed by the individual workers who will actually be performing the work for the project.
   4. Obtain written approval of the sample from project Architect before start of work.
   5. Retain approved samples through completion of the work for use as a quality standard for finished work.
   6. The mockup may remain part of the finished work if approved.

E. Mandatory Pre-Pour Installation Conference: Conduct conference at project site to comply with requirements in Section 01 0150 - Special Conditions.

F. Protection: General Contractor shall protect areas to receive polished concrete finishes at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:
   1. General Contractor to apply Ram Board or Econo-Cover temporary surface protection.
   2. All hydraulic powered equipment shall be diapered to avoid staining of the concrete.
   3. All vehicle parking shall be prohibited on the finish slab area. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
   4. No pipe cutting machine shall be used on the finished floor slab.
   5. Steel shall not be placed on the finish slab to avoid rusting.

6. Acids and acidic detergents will not come in contact with slab.
7. All painters will use drop cloths on the concrete. If paint gets on the concrete, it must be immediately removed.
8. All trades will be informed that the slab must be protected at all times.

G. Environmental Limitations
1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting chemical performance.
2. Flatness and levelness
   a. Finish Concrete shall have a minimum Floor Flatness rating of at least **45**.
   b. Finish Concrete shall have a minimum Floor Levelness rating of at least **35**.
   c. Finish Concrete shall be cured a minimum of 28 days or at which point equipment can be put on the slab and does not displace aggregate.
3. Application of finish system shall take place a minimum of 21 days prior to fixture & trim installation and/or substantial completion.
4. Finish Concrete area shall be closed to traffic during finish floor application and after application, for the time as recommended by manufacturer.

H. Concrete Mix Design:
1. Concrete Mixture shall be 4,000 PSI or higher, non-air entrained.
   a. Any admixtures, plasticizers, slag, fly ash or anything taking the place of Portland-based cement shall be kept to a minimum.
   b. The cement shall be Portland Cement Type I, conforming to ASTM C 150.
   c. Maintain concrete temperature below 85 degrees. Keep concrete as cool and moist for as long as possible. In essence, decrease rate of hydration and drying to minimize cracking.
   d. Wet cures are most suitable, but if this cannot be achieved, use a dissipating cure and seal only.
   e. All mix designs must be approved by Architect. Send all approved mix designs to Installer/Applicator.
   f. The Engineer/Architect shall determine the saw cut pattern, color and layout.
   g. Color loads for integral color should never be smaller than three (3) cubic yards.
   h. Use one (1) source for cement, aggregates and pozzolans throughout the job. Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.
   i. Wash out all drums before loading. Keep slumps consistent with a maximum of four (4). Minimize driver added water maintaining a .45 water content ratio.
   j. Place concrete to achieve as true and smooth a top surface as possible. Mounds, or dips are not acceptable. GC shall control overall flatness and levelness, including on sloping areas to within tolerances permitted by specification - ASTM E1155.
   k. Slab shall be protected from indention and footprints during pour and curing.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.

B. Store specified products in conditions recommended by the manufacturer.

1.06 JOB SITE CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature of between 50° F and 90° F during application and at least 48 hours after application.

B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Euclid Chemical: www.euclidchemical.com.

B. Ameripolish 3D HS; Ameripolish, Inc.

C. Prosoco, Inc.: www.prosoco.com.

D. Dayton Superior Corporation: www.daytonsuperior.com.

E. Substitutions: See Section 01600 - Product Requirements.

2.02 PRODUCTS

A. Densifier: a concrete hardener chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.
   1. Basis of Design: EUCO Diamond Hard.

B. Control Joint and Saw Cut Filler, two part polyurea.
   1. Hi-Tech HT-PE85; Hi-Tech Systems.
   2. Spal-Pro RS-88; Metzger/McGuire.
   3. Euclid QuickJoint 200, (Grey Only); Euclid Chemical Company.

C. Substitutions: The use of any products other than those specified will be considered providing that the contractor requests its use in writing within fourteen (14) days prior to bid date. This request shall be accompanied by:
   1. A certificate of compliance from the material manufacturer stating that the proposed products meet or exceed the requirements for this specification.
   2. Documented proof that the proposed material has a five (5) year proven record of performance for sealing, hardening and densifying concrete substrates, confirmed by at least two (2) local projects that the Architect can examine.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. New Concrete
   1. Apply sealer/densifier immediately after final finishing and installation of control joints (if manufacturer's recommendations permit); when the concrete surface won't be marred by foot traffic and after joints have been cut and cleaned or anytime thereafter. Remove soft cut saw debris prior to applying sealer/densifier. Surface shall be swept, and mopped or
   2. pressure-washed as necessary to insure no dirt, grit, trash, or similar items mar finished product. Remove all markings, including paint, marker or pencil marks. Inspect floor surface prior to application to be sure it is ready for sealer/densifier.

B. Existing Concrete
   1. Remove all dirt, debris, or curing compounds using appropriate surface prep cleaner. Allow cleaning waters used in surface preparation to dry.

C. Final Saw-Cutting
   1. Layout and cut precise edges at over-poured floor depressions and slab edges and remove excess concrete material to the depth of the depression.

3.03 APPLICATION OF SEALER

A. New Concrete
   1. The surface shall be sealed with a sealer produced of the type specified under Products above.

a. Also apply manufacturer's protection coat as specified above.

2. Apply at the rates and method recommended by manufacturer in written instructions which the installer shall have at the job site.
3. Apply a single coat using low pressure sprayer fitted with 0.5 gal/min spray tip. Lightly apply sufficient product to wet the surface without producing puddles. Use clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
4. If surfaces dry immediately, increase the rate of application. Surfaces should remain wet 5 to 10 minutes. Adjust rate of application to eliminate puddles. Any white residue must be removed immediately.
5. Allow treated surfaces to dry.
6. For uncured steel troweled concrete, immediately apply the specified curing compound or initiate specified curing procecure.
7. When the curing process is complete, use an automatic floor scrubber equipped with cleaning pads or brushes appropriate for removal of accumulated construction soiling and surface residues. Avoid pads or brushes which may damage the finished floor.

B. Existing Concrete
1. The surface shall be sealed with a sealer produced of the type specified under Products above.
a. Also apply manufacturer's protection coat as specified above.
2. Apply at the rates and method recommended by manufacturer in written instructions which the installer shall have at the job site.
3. Apply a single coat using low pressure sprayer fitted with 0.5 gal/min spray tip. Lightly apply sufficient product to wet the surface without producing puddles. Use clean, soft bristle push broom or microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.
4. If surfaces dry immediately, increase the rate of application. Surfaces should remain wet 5 to 10 minutes. Adjust rate of application to eliminate puddles. Any white residue must be removed immediately.
5. Allow treated surfaces to dry.
6. Remove any dried powder residue using a stiff broom, power sweeper, or auto-scrubbing machine.
7. Dry-Buff or burnish concrete surface in both directions with orbital floor machine or burnisher equipped with appropriate polishing pad for additional surface sheen.

3.04 PROTECTION

A. Protection: General Contractor shall protect areas to receive sealed concrete finish at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured.

B. Do not allow any trade to park any vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.

C. Diaper all hydraulic powered equipment to avoid staining of the concrete.

D. Place no steel on interior slab to avoid rust stains and gouges. If construction dictates necessity of this, interior slab will be protected with 1/2-inch plyboard.

E. Do not allow acids and acidic detergents to come into contact with slab.

F. Inform all trades that the slab must be protected at all times.

G. Protect finished work until fully cured in accordance with manufacturer's recommendations.

H. Protect completed floor from damage until Substantial Completion.
1. Do not allow vehicle and pedestrian traffic on unprotected floor.
2. Do not allow construction materials, equipment, and tools on unprotected floor.

I. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed floor.

J. Repair damaged areas of completed floor to satisfaction of Architect.

K. Protect floor from traffic for at least 72 hours after final application of sealer.

L. Plywood slab protection in traffic corridors, entry ways, and areas to receive sealer shall be provided by and maintained by General Contractor throughout construction until the finishing contractor takes ownership of the floor. Protection shall be sufficient to protect surface from damage due to traffic and impact from any and all construction activities with a minimum of 1/2" plywood. All seams of plywood shall be sealed to eliminate passage of debris to new floor.

M. Protect slab during masonry work and after completion of sealer work with minimum of 1/2-inch plyboard, with sealed seams.

N. Upon completion of sealer, the General Contractor and the finishing subcontractor shall replace the plywood protection for the duration of the project.

3.05 MAINTENANCE

A. Sealed floors should be maintained by sweeping. Spills should be cleaned when they occur and dirt shall be rinsed off with water. Heavily soiled areas may be wet-cleaned by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Interior floors that require polishing should be maintained using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

END OF SECTION

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SECTION 03 3680
CONCRETE POLISHING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes polished concrete finish for interior concrete floors denoted on Finish Schedule as PC (Polished Dyed Concrete).

B. Furnish all labor, material, equipment and services necessary for the dry diamond grinding and polishing of concrete floors.

C. Applying densifying impregnator/sealer and polishing to specified sheen level and aggregate exposure.

D. Concrete must be cured a minimum of 28 days prior to polishing.

E. PROTECTION OF CONCRETE SLABS DURING CONSTRUCTION.

1.02 RELATED SECTIONS

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

B. Section 03 3000 - Cast-in-Place Concrete: Concrete materials, placing, and finishing.

C. Section 03 3010 - Cast-in-Place Concrete for Exposed Concrete Floors.

D. Section 03 3660 - Sealed Concrete Floors.

1.03 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI302.1R-89, Guide for Concrete Floor and Slab Construction.

B. American Society for Testing and Materials:
   1. ASTM C779, Standard Test Method for Abrasion of Horizontal Concrete Surfaces.
   2. ASTM C805, Impact Strength.
   3. ASTM G23-81, Ultraviolet Light & Water Spray.
   4. ASTM 1028, Co-efficient of Friction.
   5. ASTM C 150, Type I, II Portland cement conformity, depending on soil conditions.
   6. ASTM C 33, Aggregate conformity.

C. Other Tests:
   1. Reflectivity.

1.04 SUBMITTALS

A. Submit the following in accordance with Submittal Procedures in Division 1 Sections.

B. Product data for concrete densifying impregnator, penetrating sealer, concrete dyes, joint filler and any other chemicals used in the process.

C. Applicators qualification data.

D. Polished concrete samples: size 3"x3" for each Polished Concrete finish required.

E. Maintenance procedures for Polished Concrete using diamond impregnated cleaning pads.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of specified sealer shall have a minimum TEN (10) years experience in the production of the specified products.

B. Contractor Qualifications: Contractor must have a minimum FIVE (5) years experience in sealing applications and successfully completed not less than SIX (6) projects comparable in scale and complexity.

1. Installer/applicator shall be certified by concrete grinding/polishing equipment, chemical manufacturer and caulking manufacturer. Installer/applicator shall provide adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
2. Manufacturer's Certification: Provide a letter of certification from both the equipment and chemical manufacturer stating that the installer is a Certified Contractor and is familiar with proper procedures and installation requirements recommended by the manufacturer.
3. Provide project names, addresses, contact names, phone numbers of at least SIX (6) projects of similar scope and size completed by the installer.

C. Mock-ups:
1. General Contractor to notify applicator 7 days prior to pour to schedule finish of mock-up.
2. Reserve 100 square feet for each color and finish at location adjacent to floor that will receive polish, but will be covered with another flooring material. Mock-up floor shall be placed on the same day, preferably the same pour as the floors to receive polish.
3. Install mock-ups to verify selections made under sample submittal and to demonstrate methods and workmanship proposed for the project. If mock-up not possible, submitted samples will be accepted as demonstrated methods & workmanship.
4. If stand-alone mockup required, form should be clean and free from extraneous substance and be at least a 10' x 10' with a level plywood bottom on level ground with unobstructed access around all four sides.
5. Control joints should be included in mock-up. Sawing performed by General Contractor can begin as soon as the surface is firm enough not to displace any of the aggregate.
6. Edges should be included in mock-up.
7. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.
8. Provide protection for Mock-up as specified for finished areas.

D. Mandatory Pre-Pour Installation Conference: Conduct conference at project site to comply with requirements in Section 01 0150 - Special Conditions.

E. Protection: General Contractor shall protect areas to receive polished concrete finishes at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:
1. General Contractor to apply Ram Board or Econo-Cover temporary surface protection.
2. All hydraulic powered equipment shall be diapered to avoid staining of the concrete.
3. All vehicle parking shall be prohibited on the finish slab area. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
4. No pipe cutting machine shall be used on the finished floor slab.
5. Steel shall not be placed on the finish slab to avoid rusting.
6. Acids and acidic detergents will not come in contact with slab.
7. All painters will use drop cloths on the concrete. If paint gets on the concrete, it must be immediately removed.
8. All trades will be informed that the slab must be protected at all times.

F. Environmental Limitations:
1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting chemical performance.
2. Flatness and levelness:
   a. Finish Concrete shall have a minimum Floor Flatness rating of at least **45**.
   b. Finish Concrete shall have a minimum Floor Levelness rating of at least **35**.
   c. Finish Concrete shall be cured a minimum of 28 days or at which point equipment can be put on the slab and does not displace aggregate.
3. Application of finish system shall take place a minimum of 21 days prior to fixture & trim installation and/or substantial completion.

4. Finish Concrete area shall be closed to traffic during finish floor application and after application, for the time as recommended by manufacturer.

G. Concrete Mix Design:
   1. Concrete Mixture shall be 4,000 PSI or higher, non-air entrained.
      a. Any admixtures, plasticizers, slag, fly ash or anything taking the place of Portland-based cement shall be kept to a minimum.
      b. The cement shall be Portland Cement Type I, conforming to ASTM C 150.
      c. Maintain concrete temperature below 85 degrees. Keep concrete as cool and moist for as long as possible. In essence, decrease rate of hydration and drying to minimize cracking.
      d. Wet cures are most suitable, but if this cannot be achieved, use a dissipating cure and seal only.
      e. All mix designs must be approved by Architect. Send all approved mix designs to Installer/Applicator.
      f. The Engineer/Architect shall determine the saw cut pattern, color and layout.
      g. Color loads for integral color should never be smaller than three (3) cubic yards.
      h. Use one (1) source for cement, aggregates and pozzolans throughout the job. Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.
      i. Wash out all drums before loading. Keep slumps consistent with a maximum of four (4). Minimize driver added water maintaining a .45 water content ratio.
      j. Place concrete to achieve as true and smooth a top surface as possible. Mounds, or dips are not acceptable. GC shall control overall flatness and levelness, including on sloping areas to within tolerances permitted by specification - ASTM E1155.
      k. Slab shall be protected from indention and footprints during pour and curing.

PART 2 - PRODUCTS

2.01 POLISHING MATERIALS

A. Three-phase 480 Volt generator.

B. 3 head or 4 head counter rotating, variable speed, electric floor grinding/polishing machines with at least 600 pounds down pressure. For example: HTC 950RX, HTC 800 HD, SASE PDG 8000, Husqvarna PG 820. No substitutions allowed.

C. HTC/Pullman Dust extraction system, pre-separator, and squeegee attachments with minimum flow rating of 322 cubic feet per minute such as the HTC 75D, HTC 86D, T8600, T12600, Bull 500, Bull 1250 & T55 or C5500. No substitutions allowed.

D. Grinding tools:
   1. Metal bonded diamonds 40, 80 and 150 metal or QuickCut transitional.
   2. Resin bonded diamonds 100, 200, 400 and 800 grits.

E. Grinding Pads for Edges:
   1. Metal bonded diamonds 50 and 100 grits.
   2. Resin bonded diamonds 100, 200, 400 and 800 grits.

F. Hand Grinder with dust extraction attachment and pads.

G. Densifier: A concrete hardener chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids.
   1. Ameripolish 3D HS; Ameripolish, Inc.
   2. Consolideck LS; PROSOCO
   3. Scofield Formula One MP; Sika/Scofield
   4. No substitutions allowed.

H. Control Joint and Saw Cut Filler, two part polyurea.
   1. Hi-Tech HT-PE85; Hi-Tech Systems

2. No substitutions allowed.

I. Dye: A penetrating dye that chemically combines with cured concrete to produce permanent, variegated or translucent color effects.
   1. Ameripolish Dye; Ameripolish, Inc.
   2. Gemtone Stain; PROSOCO
   3. No substitutions allowed.

J. Penetrating Stain Guard: Protection from debris and contaminants
   1. Ameripolish 3D SP; Ameripolish, Inc.
   2. Consolideck LS Guard; PROSOCO
   3. Scofield Formula One Guard-W; Sika/Scofield
   4. No substitutions allowed.

K. Stain Resistor/Inhibitor: Additional protection for food service areas.
   1. Ameripolish SR2 Stain Resistor; Ameripolish, Inc.
   2. Consolideck Concrete Protector; PROSOCO
   3. No substitutions allowed.

L. Diamond Impregnated Burnishing Pads
   1. Trifecta Pads; SASE Company, Inc.
   2. Twister Pads; HTC
   3. HiperClean Pads; Husqvarna
   4. No substitutions allowed.

M. Epoxy Floor Coatings: Type recommended by the manufacturer for this application.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installer shall examine and approve concrete substrate for conditions affecting performance of finish. General Contractor shall correct conditions that are found to be out of compliance with the requirements of this section. Repairs are not acceptable unless specifically approved on a case-by-case basis by the Architect.

B. Verify that base slab meet finish and surface profile requirements listed in Division 3, Section “Cast in Place Concrete”.

C. Provide floor clean of materials and debris.

D. Protect adjacent surfaces as required to prevent damage by the concrete polishing procedure.

E. Setup grinding machine, dust extraction system, tooling, and generator.

F. Ensure floor cured to accept polishing application.

G. Final Saw-Cutting:
   1. Layout and cut precise edges at over-poured floor depressions and slab edges and remove excess concrete material to the depth of the depression.

3.02 POLISHED CONCRETE APPLICATION

A. Applicator shall examine the areas and conditions under which work of this section will be provided and the General Contractor shall correct conditions detrimental to the timely and proper completion of the work and the Applicator shall not proceed until unsatisfactory conditions are resolved.

B. Fill construction joints and cracks with filler products as specified in accordance with manufacturer’s instructions colored to match (or contrast) with concrete color as specified by architect. All control joint and decorative saw cut filling must be performed prior to grinding application.

C. Saw cut recessed floor mat and recessed tile slab edges to final dimension at locations of overpoured conrete. Remove excess concrete to depth of recess.

D. Grind the concrete floor to within 2 -3 inches of wall with 40 grit metal, 80 grit metal and 150 grit metal or QuickCut transitional diamonds removing construction debris, floor slab imperfections and until there is a

uniform scratch pattern and desired concrete aggregate exposure is achieved. Each subsequent grind shall be at 90 degrees from each previous grind and remove all the scratches from the previous grind. Vacuum the floor thoroughly using a squeegee vacuum attachment. Utilize the least aggressive diamond tooling necessary to remove all debris and to achieve uniform scratch pattern. Final surface finish to be salt and pepper.

E. Grind the edges with 50 and 100 grit metal grinding pads, prior to grinding the floor with each step on the larger diamond grinder, removing all of the scratches from the previous grit. Vacuum the floor thoroughly after each grind, using a squeegee vacuum attachment.

F. Polish the floor with resin bonded diamond grits of 100, 200, 400, first polishing the edges with pads of the same grit and then the field of the floor, removing all scratches from the previous grit. After each polish, clean the floor thoroughly using a vacuum with a squeegee attachment. After the 400 grit polishing step thoroughly clean the floor with a mop or auto-scrubber.

G. If specified, apply dye color per manufacturer's recommendations. Apply two coats of dye to achieve desired coloration.

H. Apply densifying impregnator undiluted as per manufacturer's specifications and guidelines. Cover the entire work area liberally and allow to sit for 10 minutes. Apply again to areas where the densifying impregnator has soaked in and allow to sit for an additional 30 minutes. Squeegee excess material off the floor.

I. Polish the floor with resin bonded diamond grit of 800, first polishing the edges with pads of the same grit and then the field of the floor, removing all scratches from the previous grit. After polishing, clean the floor thoroughly using clean water and an auto-scrubber or a mop and a wet vacuum.

J. Apply Penetrating Stain Guard with a microfiber applicator and burnish with a fine, 800 grit, or very fine, 1500 grit, diamond impregnated polishing pad.

K. Where required, apply Stain Resistor/ Inhibitor with a microfiber applicator and burnish with a fine, 800 grit, or very fine, 1500 grit, diamong imprednated burnishing pad.

L. Upon completion, the work shall be ready for final inspection and acceptance by the customer.

3.03 PROTECTION

A. General Contractor to apply Skudo LT (Light Traffic), Ram Board or Econo-Cover temporary surface protection.

B. Do not allow any trade to park any vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.

C. Diaper all hydraulic powered equipment to avoid staining of the concrete.

D. Protect slab after completion of polishing and dyeing work with Ram Board floor protection cover, Econo-Cover or equal. Overlap and tape seams.

E. Place no steel on interior slab to avoid rust stains and gouges. If construction dictates necessity of this, interior slab will be protected with 1/2-inch plyboard.

F. Do not allow acids and acidic detergents to come into contact with slab.

G. Inform all trades that the slab must be protected at all times.

H. Protect finished work until fully cured in accordance with manufacturer's recommendations.

I. Protect completed floor from damage until Substantial Completion.
   1. Do not allow vehicle and pedestrian traffic on unprotected floor.
   2. Do not allow construction materials, equipment, and tools on unprotected floor.

J. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed floor.

K. Protect floor from traffic for at least 24 hours and from water for at least 72 hours after completion of polishing and dyeing.

PART 4 - SCHEDULES

4.01 SHEEN

A. Polished Concrete Level 1 - 400 grit (Matte Finish):
   1. At a distance of 30 to 50 feet, the floor will reveal moderate light reflection.
   2. Yield an average gloss reading of 20 - 40, as measured by a Horiba Gloss Meter.

B. Polished Concrete Level 2 - 800 grit (Medium Gloss Finish):
   1. At a distance of 30 to 50 feet, the floor will reveal moderate light reflection.
   2. Yield an average gloss reading of 40 - 60, as measured by a Horiba Gloss Meter.

4.02 EXPOSED AGGREGATE

A. Minimal exposure, Salt and Pepper

4.03 DYE COLOR

A. See finish schedule for dye color(s).

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMU) for load-bearing and non-loading-bearing wall construction.
2. Clay face brick.
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. Division 5 Section - "Cold-Formed Metal Framing."
2. Division 7 Section - "Fluid-Applied Membrane Air Barriers."
3. Division 7 Section - "Thermal Insulation."
4. Division 7 Section - "Flashing and Sheet Metal."
5. Division 7 Section - "Joint Sealants."
6. Division 8 Section – "Aluminum-Framed Entrances and Storefronts."
7. Division 8 Section – "Glazed Aluminum Curtain Wall Systems."

C. Products installed, but not furnished, under this Section include the following:

1. Cast stone masonry units specified in Division 4 Section " Cast Stone Masonry."
2. Steel lintels for unit masonry, furnished under Division 5 Section "Metal Fabrications."
3. Hollow metal frames to be built into masonry walls as specified in Division 8 Section "Hollow Metal Doors and Frames."

1.3 DEFINITIONS:

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS:

A. Compressive Strength of Masonry: Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1. Concrete Unit Masonry: f'm of not less than 2000 psi.
2. Brick Unit Masonry: f'm of not less than 2500 psi.

B. Structural Performance and Deflection Requirements for Adjustable Masonry Ties: Provide veneer anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Adjustable masonry tie assemblies shall limit total lateral mechanical play to 0.02-inch minimum, and 0.05-inch maximum.
2. Maximum deflection of ties shall be less than 0.05-inch when subjected to an axial load of 100 lbf in tension and compression.
3. Adjustable tie assemblies shall meet deflection requirements when eccentrically loaded per actual installation conditions with provisions for positive vertical and horizontal movement limitations in plane parallel to wall.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency or by equivalent concrete masonry thickness method indicated in governing code and as acceptable to authorities having jurisdiction.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's product literature and technical data for items listed as follows:

1. Manufactured mortars, cements and admixtures. Include mixing and installation instructions.
2. Masonry joint reinforcement and accessories, including veneer ties and anchors.
3. Through-wall flashing materials.
4. Miscellaneous masonry accessories, including preformed control joints, compressible filler materials, cavity drainage and weep materials, masonry cleaning compounds and sealers.

B. Shop Drawings: Submit for the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples:

1. For Initial Selection:

F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

H. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements. Submit only when conditions are required to meet construction schedule as authorized by Architect.

1.6 QUALITY ASSURANCE:

A. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1093 for testing indicated as documented according to ASTM E 548.

B. Source Limitations:

1. Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
2. Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate. For each type cement specified, only one brand shall be used throughout the project.

C. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials failing to meet specified requirements shall be performed at Contractor's expense.

1. Concrete Masonry Unit Test: For each type concrete masonry unit indicated, per ASTM C 140.
2. Mortar Test: For mortar properties per ASTM C 270.
3. Grout Test: For compressive strength per ASTM C 1019.

D. Sample Panels: Build sample panels at the project site to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Construct minimum 6-ft. (72-inches) long by 6-ft. (72-inches) high sample wall panel of masonry veneer using specified face brick units and architectural ground face concrete masonry units laid with gypsum sheathed metal stud backup support framing, mortar and accessories. Orient panel as directed by the Architect.
2. Sample panel shall indicate not less than the following:
   a. Bonding pattern.

b. Mortar color and joint tooling.
c. Face brick color and texture.
d. Cast stone cap or trim color and texture.
e. Joint reinforcement and veneer ties.
f. Cavity clearance.
g. Air barrier applied to gypsum sheathed framing back-up.
h. Through-wall flashing, weeps and cavity drainage materials.
i. Typical brick expansion joint and concrete masonry unit control joint; sealed with backer rod and sealant.
j. Fenestration with storefront framing.
k. Workmanship.

3. Clean one-half of exposed faces of panels with masonry cleaner specified after approval of sample panel and as directed Architect.
4. Prepare panel at least fourteen (14) days prior to beginning masonry work. Should the panel not be accepted, prepare additional panels until accepted by Architect.
5. Protect approved sample panels from the elements with weather-resistant membrane.
6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

F. Air Barrier Inspection: Obtain Architect's inspection and acceptance of fluid-applied air barrier membrane application before starting installation of masonry veneer construction.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Deliver reinforcement and accessories in bundles or boxes with waterproof tags. Maintain tags attached until material is incorporated into the work.

B. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

C. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover in a dry location or in covered weatherproof dispensing silos.

E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp or wet.

F. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.8 PROJECT CONDITIONS:

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 2-ft. (24-inches) down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 2-ft. (24-inches) down face next to unconstructed wythe and hold cover in place.

B. Loading Precautions: Do not apply uniform floor or roof loads for at least twelve (12) hours and concentrated loads for at least three (3) days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. 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.

1. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
2. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than seven (7) days after completing cleaning.

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

PART 2 PRODUCTS

2.1 MASONRY UNITS, GENERAL:

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 CONCRETE MASONRY UNITS (CMUS):

A. Concrete Masonry Units: ASTM C 90, hollow and solid units.

1. Weight Classification: Lightweight, maximum 105-pcf, unless otherwise indicated.
2. Net Area Compressive Strength: 2000 psi minimum average.
3. Nominal Face Dimensions: 8-inches by 16-inches, unless otherwise indicated on drawings.
4. Thickness: As indicated on drawings.
5. Exposed Faces: Provide units with uniform color and texture.

B. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for external corners located in interior of building, unless otherwise indicated.

C. Concrete Building Brick: Meeting ASTM C 55**,** Grade N.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength 3500 psi.
2. Weight Classification: Medium or Normal weight.
3. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2.3 MASONRY OR PRECAST CONCRETE LINTELS:

A. Provide masonry or precast concrete lintels for masonry construction complying with specified requirements.

B. Masonry Lintels: Built-in-place masonry lintels made from bond beam concrete masonry units matching adjacent masonry units in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout.

1. Provide Architectural ground face concrete masonry lintel units for exterior single wythe wall construction where indicated.
2. Cure precast lintels before handling and installing.
3. Temporarily support built-in-place lintels until cured.

C. Precast Concrete Lintel Units: Precast lintels may be used at Contractor's option subject to review and acceptance of manufacturer's structural design analysis.

1. Unit Type: Precast lintel units sized to match concrete masonry unit wall construction.
2. Concrete Materials:
   a. Portland cement: Meeting ASTM C 150, Type I or III, gray color.
   b. Aggregate: Meeting ASTM C 33, fine and coarse aggregates; gradation as required. Aggregates shall be clean, hard, durable, inert and free of staining or deleterious materials.
   c. Admixtures: Water reducing, retarding, accelerating chemical admixtures meeting ASTM C 494; free of calcium chloride or chloride ions.
   d. Water: Clean, potable, free of alkali, acid, oil, impurities or organic matter.
3. Reinforcing Materials:
   a. Reinforcing Bars: Deformed bars meeting ASTM A 615/A 615M, Grade 40 (Grade 300) or Grade 60 (Grade 420).
   b. Prestressing Strands: Uncoated, seven-wire steel strand meeting ASTM A 416/A 416M, Grade 270 (Grade 1860); low relaxation type.
4. Precast Characteristics: Fabrication conforming with PCI MNL-116. Provide precast or prestressed units for lintel lengths required complying with manufacturer's span and load tables.
   a. Concrete Type: Normal weight, 135-160 pcf.
   b. Compressive Strength: Tested according to ASTM C 39 at 28 days with strengths specified for indicated unit types.
      1) Precast units: Minimum 3500 psi.
      2) Prestressed units: Minimum 6000 psi.
   c. Water-Cement/Cementitious Material Ratio at point of placement: Maximum 0.40.
   d. Water Absorption: Maximum 6-percent by weight at 28 days when tested according to ASTM C 642.
5. Finish: Smooth Form Finish meeting requirements of ACI 301 or Sand Block Finish as recommended by precast fabricator. Exposed face shall be scored to match mortar joints to simulate masonry units.

2.4 FACE BRICK

A. Brick Allowance: Allow the sum of Four Hundred Fifty Dollars ($450.00) per thousand net invoice cost F.O.B. project site for furnishing face brick.

B. Face Brick Characteristics:

1. Grade and Type:
   a. Hollow Brick Units: Meeting ASTM C 652, Grade SW, Type HBS or HBX.
   b. Solid Brick Units: Meeting ASTM C 216, Grade SW, Type FBS or FBX.

2. Size: 3-5/8 inches width by 2-1/4 inches height by 7-5/8 inches length (Actual Dimensions).
3. Color and Texture: As selected by Architect.

C. Special Shapes: Provide special shape units of same quality, color and texture as specified for face brick, including, but not limited to the following:

1. Solid end units for sills and for similar applications that would otherwise expose unfinished brick surfaces; provide units without cores or frogs and with exposed surfaces finished.
2. Corner units where applications produced by sawing would result in sawed surfaces being exposed to view.
3. Special shaped units for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Special shapes for applications where stretcher units cannot accommodate special conditions, including those at movement joints, bond beams, sashes, and lintels.

2.5 MORTAR AND GROUT MATERIALS:

A. Portland Cement: ASTM C 150, 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 S.

C. Masonry Cement: ASTM C 91, non-staining, 18-percent maximum air content by volume and proportioned to comply with requirements of ASTM C270 for Type “S” mortar.

D. Packaged, Colored Masonry Cement:

1. Acceptable Products; subject to compliance with specified requirements:
   a. Argos USA Corp., Magnolia Masonry Cement.
   b. Holcim (US) Inc.; Rainbow Mortamix Custom Masonry Cement.
   c. Lehigh Hanson / Heidelburg Cement Group; Flamingo-Brixment Colored Masonry Cement.
   d. National Cement Company, Inc., Coosa Masonry Cements.
2. Characteristics: Factory prepared, non-staining masonry cement meeting ASTM C 91, composed of inert alkali-resistant and fade resistant mineral pigments, portland cement or blended cement, plasticizers, water-reducing admixtures and air entraining additives; having 22-percent maximum air content by volume and proportioned to comply with requirements of ASTM C 270 for Type 'S' mortar with minimum 28 day compressive strength of 1800 psi.
3. Color: Custom color as selected by the Architect from samples formulated for Type "S" mortar. Color shall be from manufacturer’s white cement based formulations.

E. Aggregate for Mortar: ASTM C 144; for mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone. Provide aggregate from a single source for colored mortar.

F. Aggregate for Grout: ASTM C 404; aggregate sizes as specified for indicated grout types.

1. Fine Grout: Size no. 1 fine aggregate.
2. Coarse Grout: Size no. 8 coarse aggregate, limited to use when minimum horizontal dimensions of grouting space exceeds 4-inches.

G. Cold-Weather Admixture:

1. Acceptable Products subject to compliance with specified requirements:
   a. Euclid Chemical Company (The); Accelguard 80.
   b. GCP Applied Technologies, Inc.; Morset.
   c. BASF Corporation; MasterSet AC 534.
2. Type: 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.

H. Water: Clean, Potable, free from deleterious amounts of alkalies, acids and organic materials.

2.6 REINFORCING STEEL AND BAR POSITIONERS:

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

B. Vertical Bar Positioners:

1. Acceptable Products:
   a. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
   b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   c. Wirebond / Masonry Reinforcing Corp. of America; Figure 8 Single or Figure 8 Double Rebar Positioner.
2. Characteristics: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells.
   a. Material: Fabricated from 0.148-inch (9-gauge) diameter steel wire.
   b. Configuration: Provide units with either two loops or four loops as needed for number of bars indicated.
   c. Finish: Hot-dipped galvanized, meeting ASTM A153, Class B-2.

C. Horizontal Bar Positioners:

1. Acceptable Products:
   a. Heckmann Building Products, Inc.; No. 379.
   b. Wirebond / Masonry Reinforcing Corp. of America; Bond Beam Positioner.
2. Characteristics: Wire units designed to hold horizontal rebar in position in cells of concrete masonry bond beam or lintel units.
   a. Material: Fabricated from 0.148-inch (9-gauge) diameter steel wire.
   b. Finish: Hot-dipped galvanized, meeting ASTM A153, Class B-2.

2.7 MASONRY HORIZONTAL JOINT REINFORCEMENT:

A. Acceptable Manufacturers, subject to compliance with specified requirements:

1. Heckmann Building Products, Inc.
2. Hohmann and Barnard, Inc.
3. Wirebond / Masonry Reinforcing Corp. of America.

B. Characteristics: Masonry joint reinforcement meeting ASTM A951; types as specified.

1. Types:
   a. For single wythe masonry construction: Ladder type.
   b. For double wythe masonry construction: Ladder type with adjustable ties.
      1) Acceptable Products; subject to compliance with specified requirements:
         a) Hohmann and Barnard; 270 Ladder Eye-Wire.
         b) Heckmann; 1300 Hook & Ladder Joint Reinforcement.
         c) Wirebond; Series 800.
      2) Description: Ladder type joint reinforcing with adjustable ties consisting of double eye sections spaced at 16 inches on center and welded to longitudinal rods of joint reinforcement; sized to accommodate cavity wall and to accept pintle type rectangular wall ties.
2. Material: Fabricated from cold-drawn steel wire meeting ASTM A82.
   a. Longitudinal rods: 9 gauge (W1.7 or 0.148-inch) diameter galvanized deformed rods.
   b. Cross rods: 9 gauge (W1.7 or 0.148-inch) diameter galvanized rods spaced at maximum 16-inches on center and welded to longitudinal rods.
3. Sizes: Width of reinforcement shall be 2-inches less than nominal wall thickness, allowing longitudinal rods to be positioned on shell wall of units.
4. Lengths: Provide reinforcement in minimum 10 feet (3m) lengths.
5. Corners and Tees: Provide prefabricated corners and tees of same design and finish as joint reinforcement for intersecting walls.
6. Finishes:
   a. Reinforcement fully embedded in mortar at single wythe interior masonry: Galvanized, meeting ASTM A641, Class 3.
   b. Reinforcement at single and double wythe exterior masonry: Hot-dipped galvanized, meeting ASTM A153, Class B-2.

2.8 TIES AND ANCHORS MATERIALS:

A. Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

1. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for exterior walls.
2. Galvanized Steel Sheet: ASTM A 653/A 653M, G60, commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.

3. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.9 ADJUSTABLE MASONRY VENEER TIES FOR MASONRY JOINT REINFORCEMENT:

A. Type: Pintle type rectangular sections with turned-down legs designed to fit into eye sections of joint reinforcement; complying with specified design and performance requirements. Ties shall be joint reinforcement manufacturer's compatible products.

1. Material: Fabricated from minimum 3/16-inch diameter specified hot-dip galvanized carbon steel wire.
2. Adjustment Capabilities: Ties shall allow for approximately 1-1/4 inch vertical adjustment.
3. Tie size: Pintle ties shall be sized to extended minimum 2-1/4 inch, maximum 2-3/4 inch, into exterior masonry veneer bed joint of double wythe masonry construction.

B. Location: Provide for installation with joint reinforcement of masonry-back-up in double wythe construction.

2.10 ADJUSTABLE VENEER ANCHOR ASSEMBLIES FOR METAL STUD CONSTRUCTION:

A. Acceptable Product; subject to compliance with specified requirements:

1. Hohmann & Barnard, Inc.; X-Seal Anchor System w/ #VWT Ties.
2. Wirebond / Masonry Reinforcing Corp. of America; Type III-X Anchor w/ No. 1100 or 1501 Ties.

B. Characteristics: Screw-attached, masonry-veneer anchor assemblies consisting of a wire tie and a metal anchor section.

1. Anchor Section: Sheet metal plate, 1-1/4 inches wide by 6-inches long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation and sheathing; with raised rib-stiffened strap, 5/8-inch wide by 6-inches long, stamped into center to provide a slot between strap and plate for inserting wire tie.
   a. Fabricate sheet metal anchor sections and other sheet metal parts from 0.067-inch (14-gauge) thick, steel sheet; galvanized after fabrication.
   b. Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets manufactured to fit behind anchor plate and extend beyond pronged legs.
2. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch (3/16-inch) diameter, hot-dip galvanized steel wire.

C. Fasteners for Attachment to Steel Studs:

1. Acceptable Products; subject to compliance with specified requirements:
   a. ITW Buildex; Teks Maxiseal with Climaseal finish.
   b. Elco Construction Products / Stanley Engineered Fastening; Elco Dril-Flex with Stalgard finish.
2. Type: Polymer-coated, steel drill screws meeting ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 1000 hours per ASTM B 117.

2.11 WELD-ON TIES FOR ATTACHING TO STRUCTURAL STEEL:

A. Weld-On Column Anchors:

1. Acceptable Products; subject to compliance with specified requirements:
   a. Heckman Building Products, Inc.; No. 315 Weld-On Anchor Rods with No. 318 Web Ties.
   b. Hohmann & Barnard, Inc., #359 Weld-On Ties with #301W Column Web Ties.
   c. Wirebond / Masonry Reinforcing Corp. of America, No. 1000 Type I Weld-On Anchors with No. 1200 Ties
2. Characteristics: Column tie assembly consisting of weld-on steel anchor rod and wire tie fabricated from specified hot-dipped galvanized carbon-steel wire.
   a. Weld-On Anchor Rod: 1/4-inch diameter by 9-inch length plain steel rod formed with offset to accept wire ties.
   b. Tie: Minimum 3/16-inch diameter cold drawn steel, trapezoid shaped web ties; sizes as required to fit within width of concrete masonry unit by minimum 12-inches (1-ft.) length.

B. Weld-On Beam Anchors:

1. Acceptable Products; subject to compliance with specified requirements:
   a. Heckman Building Products, Inc.; No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties.
   b. Hohmann & Barnard, Inc., #359 Weld-On Ties with #VWT Vee Wall Ties.
   c. Wirebond / Masonry Reinforcing Corp. of America, No. 1000 Type I Weld-On Anchors with No. 1100 Series Triangular Ties.
2. Characteristics: Beam tie assembly consisting of weld-on steel anchor rod and wire tie fabricated from specified hot-dipped galvanized carbon-steel wire.
   a. Weld-On Anchor Rod: 1/4-inch diameter by 9-inch length plain steel rod formed with offset to accept wire ties.
   b. Tie: Minimum 3/16-inch diameter cold drawn steel, triangular shaped ties; sizes as required to extend minimum 2-inches, maximum 2-3/4 inches, into bed joint of exterior masonry veneer wythe.

2.12 BENT WIRE TIES:

A. Type: Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2-inches long.

B. Wire: Fabricate from 3/16-inch diameter, hot-dip galvanized steel wire.

2.13 RIGID STRAP ANCHORS:

A. Type: Strap anchors fabricated from specified steel bar material.

B. Size and Configuration: 1-1/2 inches wide by 1/4-inch thick by 24-inches long, with ends turned up 2-inches or with cross pins; except for locations where a different size is specifically indicated on the drawings.

C. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.14 MISCELLANEOUS ANCHORS:

A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.
2. Nonheaded bolts, bent in manner indicated.

B. Post-Installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Expansion anchors.
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
3. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
4. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.15 EMBEDDED FLASHING MATERIALS:

A. Flexible Flashing: Provide specified copper-fabric or stainless steel fabric flashing for through-wall applications. Use only where flashing is fully concealed in masonry.

1. Copper-Fabric Flashing:
   a. Acceptable Products; subject to compliance with specified requirements, provide one of the following:
      1) Advanced Building Products Inc.; Copper Sealtite 2000.
      2) Hohmann and Barnard, Inc.; Copper Fabric NA Flashing.

3) York Manufacturing, Inc.; Multi-Flash 500 Copper Fabric Flashing.

b. Characteristics:

1) Material: Copper sheet bonded between two layers of woven glass fiber fabric embeded in non-asphaltic adhesive polymer compound.

2) Copper weight: Minimum 5-oz./sq. ft.

2. Stainless Steel Fabric Flashing:

a. Acceptable Products; subject to compliance with specified requirements, provide one of the following:

1) Hohmann and Barnard, Inc.; Mighty-Flash.

2) TK Products / Sierra Company, LLC; TWF-18 Stainless Steel Thru-Wall Flashing.

3) York Manufacturing, Inc.; Multi-Flash SS.

b. Characteristics:

1) Material: Type 304 stainless steel sheet meeting ASTM A 167 laminated on one side with layer of polymeric fabric using non-asphaltic adhesive.

2) Properties:

a) Puncture Resistance: 2500 lbs., minimum, when tested per ASTM E 154.

b) Tensile Strength: 90,000 psi, minimum, when tested per ASTM D 412.

c) Mold Resistance: No mold growth when tested per ASTM D 3273.

B. Lap and Bonding Adhesives: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

C. Flashing Cement: Meeting ASTM D 2822-05, Type I.

D. Metal Drip Edge Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual Division 7 Section "Sheet Metal Flashing and Trim", compatible with through-wall flashing and as specified.

1. Sheet Metal Materials: Provide either copper or stainless steel as specified.

a. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight {0.0216 inch thick}; or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight {0.0162 inch thick}.

b. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.

2. Fabrication: Fabricate continuous flashings in sections 8-feet (96-inches) long minimum, but not exceeding 12-feet (144-inches). Provide splice plates at joints of formed, smooth metal flashing.

a. Metal Drip Edges: Fabricate from specified sheet metal compatible with through wall flashing material. Fabricate to extend at least 3-inches into wall and 1/2-inch out from wall, with outer edge bent down 30 degrees and hemmed.

b. Metal Drip Edges with Sealant Stops: Fabricate from specified sheet metal compatible with through wall flashing material where required for sealant installation. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8-inch to form a stop for retaining sealant backer rod.

E. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Termination Bars: Stainless steel or plastic bars with integral formed sealant lip, 1-inch width by 1/8-inch thickness approximate size; pre-drilled to accept screw fasteners.

2.16 WEEP AND DRAINAGE MATERIALS:

A. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4-inches long.

B. Cavity Drainage Material:

1. Acceptable Products; subject to compliance with specified requirements:
   a. Advanced Building Products Inc.; Mortar Break.
   b. Mortar Net USA, Ltd.; Mortar Net.
   c. Sandell Manufacturing Co., Inc.; Mortar Web.
2. Type: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity; either configuration as specified below.
   a. Strips, full-depth of cavity by 10-inches width, with dovetail shaped notches 7-inches deep that prevent mesh from being clogged with mortar droppings.
   b. Strips, not less than 3/4-inch thick and 10-inches width, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

2.17 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 Rubber Control Joints:

1. Acceptable Products:
   a. Hohmann & Barnard, Inc., RS Series Rubber Control Joint.
   b. Sandell Manufacturing Co., Inc.; Sandell's Rubber Control Joint.
   c. Wirebond / Masonry Reinforcing Corp. of America, 2900 Series Rubber Control Joint.
2. Characteristics:
   a. Type: Extruded rubber, meeting ASTM D2000-90, Designation M2AA-805, minimum 80 durometer hardness.

b. Size: Manufacturer's standard sizes to fit concrete masonry unit wall widths with allowance for sealant installation.

C. Wire Mesh Hardware Cloth: 1/2-inch by 16-gauge galvanized steel mesh, 2-inches less than wall width; length as required.

D. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.18 MASONRY CLEANING COMPOUNDS AND SEALERS:

A. Brick Cleaning Compound:

1. Acceptable Manufacturers; subject to compliance to specified requirements:
   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.
2. 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.
   a. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   b. Masonry cleaning compound shall be acceptable to brick masonry unit manufacturer and as recommended for specified materials.

2.19 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 masonry cement mortar unless otherwise indicated.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide mortar portioned as specified.

1. Masonry Cement Mortar: One part Type 'S' masonry cement to aggregate proportioned not less than 2¼ nor more than three times the volume of masonry cement used to produce Type 'S' mortar.
2. Cement-Lime Mortar: One part Portland cement and ¼ to ½ parts hydrated lime to aggregate proportioned at no less than 2¼ nor more than three times the combined volume of cement and lime used to produce Type 'S' mortar.
3. Colored Masonry Cement Mortar: One part packaged Type S masonry cement to aggregate proportioned not less than 2¼ nor more than three times the volume of masonry cement used, and as directed by masonry cement manufacturer's product data to produce Type S mortar.

C. Mortar Placement Requirements:

1. For masonry below grade, in contact with earth and where indicated: Type 'S', natural color.
2. For vertically reinforced masonry, including interior and exterior load-bearing walls: Type 'S', natural color.
3. For interior non-load bearing concrete masonry unit walls: Type 'S', natural color.
4. For all clay masonry unit (brick) veneer walls: Type 'S', colored mortar as selected by Architect.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type (coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.20 SOURCE QUALITY CONTROL:

A. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units are to have been tested according to ASTM C 140 by manufacturer. Submit results of manufacturer's testing at the beginning of the project.

B. Brick Tests: For each type and grade of brick indicated, units are to have been tested according to ASTM C 67 by manufacturer. Submit results of manufacturer's testing at the beginning of the project.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL:

A. Thickness: Build cavity walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. 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.

3.3 CONSTRUCTION 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 or minus 1/4-inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2-inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4-inch in a story height or 1/2-inch 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, or 1/2-inch 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, 1/4-inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch 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, 1/4-inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4-inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16-inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8-inch, with a maximum thickness limited to 1/2-inch.

2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8-inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8-inch or minus 1/4-inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8-inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8-inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16-inch from one masonry unit to the next.

3.4 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 Patterns:

1. For Exposed Brick Masonry: Lay exposed masonry in running bond, unless otherwise indicated; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
2. For Exposed Concrete Masonry Unit (CMU): Lay exposed masonry in one-half running bond pattern with vertical joint in each course centered on units in courses above and below. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
3. Concealed Masonry: Lay masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between non-rated hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24-inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Stop filler 1/2-inch from face of masonry for caulking with sealant specified in the Division 7 Section "Joint Sealants".

I. In-Progress Cleaning:

1. Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
2. Remove excess mortar and dust from brick surfaces using medium-soft bristle or fiber brush. Avoid any motion that will result in rubbing or pressing mortar into brick faces.

3.5 MORTAR BEDDING AND JOINTING:

A. Lay solid masonry units, including brick and hollow brick units, with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Mortar Joint Thickness: Lay masonry with 3/8-inch nominal thickness for both horizontal and vertical mortar joints, unless otherwise indicated. Keep bed and head joints uniform in width, except for minor variations required to maintain bond and locate returns

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 fluid-applied membranes, plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 CAVITY WALLS:

A. Construct cavity walls with veneer wythe anchored as follows and complying with specified requirements for anchoring masonry veneers.

1. Anchor to masonry back-up wythe using specified masonry joint reinforcement with adjustable ties installed in horizontal mortar joints.
2. Anchor masonry veneer wythe supported by metal framed wall construction using adjustable veneer anchor and tie assemblies as specified.

B. Keep cavities clean of mortar droppings and other materials during construction.

1. Bevel beds away from cavity, to minimize mortar protrusions into cavity.
2. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Coat cavity face of backup wythe to comply with Division 7 Section "Fluid-Applied Membrane Air Barriers."

D. Install cavity-wall insulation in according to Division 7 Section "Thermal Insulation."

3.7 MASONRY HORIZONTAL JOINT REINFORCEMENT:

A. Install joint reinforcement continuously for entire length of wall with longitudinal side rods embedded in mortar with a minimum cover of 5/8-inch on exterior side of walls, 1/2-inch elsewhere.

1. Space reinforcement not more than 16-inches on center, unless otherwise specified.
2. Space reinforcement not more than 8-inches on center in foundation walls and parapet walls.
3. Lap reinforcement a minimum of 6-inches.
4. At splices, cross rods may be removed to facilitate placement.
5. Install joint reinforcement with cross rods located so as not to obstruct cells at areas to receive vertical reinforcement bars.
6. Install joint reinforcement for cavity wall construction with eye sections positioned in cavity to receive installation of adjustable veneer ties.
    a. Space reinforcement with eye sections in vertical alignment to provide location for not less than one tie for each 1.77 sq. ft. of wall area.
    b. Where cavity wall insulation is required, install reinforcement so that eye sections protrudes through insulation into cavity to allow for insertion of ties.
    c. Install reinforcement with eye sections located to provide placement of ties at the following locations:
        1) Within 12-inches of masonry openings
        2) Within 8-inches at each side of masonry expansion control joints.

B. Provide additional joint reinforcement as follows:

1. Space reinforcement not more than 8-inches on center in foundation walls.
2. Provide reinforcement not more than 8-inches above and below wall openings and extending 24-inches beyond jamb of openings, each side.

C. Interrupt joint reinforcement at control and expansion joints. Stop reinforcement 1-inch back from expansion and control joints and openings in masonry walls.

D. Provide continuity at wall intersections and corners by using prefabricated T- or L-shaped units. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY VENEERS:

A. Masonry Back-Up Construction: Install pintle wall ties to eye sections of joint reinforcement laid in masonry construction and embed in bed joint of masonry veneer wythe as work progresses. Maximum misalignment of bed joints between masonry wythe for tie placement shall not exceed manufacturer's recommended spacing.

B. Metal Stud Back-Up Construction: Anchor masonry veneers to wall framing backup with masonry-veneer anchors to comply with the following requirements:

1. Screw-attach anchors through insulation and sheathing to wall framing with

specified metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.

2. Embed tie sections in masonry joints. Provide not less than 2-inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16-inches on center, vertically, and 24-inches on center, horizontally, with not less than 1 anchor for each 2-sq. ft. of wall area.
    a. Install additional anchors within 12-inches of openings and at intervals, not exceeding 8-inches, around perimeter.
    b. Install additional ties at each side of masonry expansion control joints, within 8-inches of joint, in addition to spacings specified.
    c. Install additional ties at each side of building expansion joints located in masonry walls, within 8-inches of joint, in addition to spacings specified.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS:

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

B. Weld-On Beam Anchors: Weld beam anchor rod tie receptors to steel beams adjacent to masonry veneer wythe at 32-inches (2'-8") maximum horizontal centers. Install wire ties to anchor rod receptors and set in mortar bed as masonry is laid.

C. Weld-On Column Anchors: Install column anchors at locations indicated. Weld anchor rod tie receptors to steel columns spaced at 16-inches (1-4") vertical centers and aligned with masonry joints. Insert ties to anchor rod receptors and set in mortar bed as masonry is laid.

3.10 CONTROL AND EXPANSION JOINTS:

A. Install control joint materials in unit masonry where indicated on the Drawings. If not indicated, spacing shall not exceed industry standard. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Control Joints in Concrete Masonry Unit Construction:

1. Make joint 3/8-inch wide, unless otherwise indicated. Construct joints straight, plumb and vertical.

2. Stop horizontal joint reinforcement 1-inch from control joints.
3. Where control joints occur in running walls, provide sash block with rubber control joint filler. Build in control joint fillers installed in masonry as work progresses. At exposed locations, recess face of fillers 3/8-inch from finished masonry surface for application of sealant.
4. Provide masonry control joints at locations indicated on drawings, but at not less than the following locations:
    a. In running walls spaced maximum 35-ft. on center.
    b. At intersecting walls, either of which is more than 10-ft. long.
    c. At structural columns.
    d. At joint between masonry and structural slabs beams or decks.
    e. At all changes in wall thickness.
    f. At all abrupt changes in wall height.
5. Where control joints are not indicated on Contract Drawings, locations shall be in accord with final reviewed and accepted shop drawings, complying with specified requirements indicated above.
6. Leave joint open and clean for installation of sealant and backer rod in accord with Division 7 Section "Joint Sealants." Caulk joints exterior and interior with specified sealant material.

C. Brick Expansion Control Joints: Install expansion control joint and pressure relieving joint materials in brick masonry construction as work progresses. Place expansion control joints at locations indicated on Drawings, or if not indicated, not more than 25'-0" on center.

1. Do not allow materials to span expansion control joints without provision to allow for in-plane wall or partition movement.
2. Construct 1/2-inch wide open vertical joints in veneer wythe to allow for movement; unless otherwise indicated.
    a. Construct vertical joints straight and plumb; horizontal joints level and true to line.
    b. Provide temporary spacers to construct joints to prevent mortar and debris from entering joints, except where a filler material is to be inserted into the joints such a backer rod for sealant application.
    c. Remove spacers and clean joint surfaces when ready for sealant installation.
3. Keep joints free of mortar and debris.
4. Caulk control joints using specified sealant.
    a. Install sealant and backer rod specified in Division 7 Section "Joint Sealants."
    b. Joints shall be watertight after caulking.

D. Provide horizontal, pressure-relieving joints where indicated. Construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."

E. Building Expansion Joints in Masonry Walls:

1. Construct joints to widths indicated, straight, plumb and vertical.

2. Stop joint reinforcement in masonry back-up wythe 1-inch from each side of expansion joint. Locate veneer ties on each side of joint as specified.
3. Keep joint clear of mortar as wall is laid.
4. Leave joint open and clean for installation of sealant system as specified in Division 7 Section "Joint Sealants."

3.11 LINTELS:

A. Steel Lintels: Install steel lintels where indicated.

B. Masonry Lintels: Install masonry lintels where shown and where openings of more than 8-inches for block-size units and more than 6-inches for brick-size units are shown without structural steel or other supporting lintels.

1. Construct built-in-place masonry lintels using specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Temporarily support built-in-place lintels until cured.
2. See structural drawings for lintel reinforcing.

C. Precast Concrete Lintel: Specified precast concrete lintel units may be installed in place of masonry lintels at Contractor's option.

1. Precast lintel designs based on manufacturer's design analysis complying with specified building code requirements and loading conditions indicated on drawings may be submitted for Architect's consideration.
2. Architect's acceptance of precast lintels will be based on review and substantiation of manufacturer's structural analysis verifying that the integrity of the design will not be compromised.

D. Provide minimum bearing of 8-inches at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS:

A. Install embedded through-wall flashing and weep holes in masonry at lintels, shelf angles, ledges, head and sills of exterior masonry openings, at base of wall along floor line just above finish grade and other obstructions to direct flow of water out of wall cavities, and where indicated.

B. Provide through flashing in sufficient widths for installation through wall construction as specified, terminating within 1/2-inch of face of exterior masonry wythe and to lap over drip edge flashing.

C. 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.

D. Install flashing as follows, unless otherwise indicated:

1. At multiwythe masonry walls, including cavity walls, place flashing located 1/2-inch from outside face of exterior veneer wythe lapped and sealed over metal drip edge flashing, extending through wall into cavity or collar joints and turned

up a minimum of 8-inches against face of inner wythe and 1-1/2 inches into the mortar bed joint of inner wythe.

2. At masonry-veneer walls with framed stud back-up construction, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8-inches; with upper edge secured in place using continuous termination bar screw-attached through sheathing into each metal studs. Seal top edge with continuous sealant bead or self-adhering flashing strip as specified in Division 7 Section " Fluid-Applied Membrane Air Barriers."
3. At lintels and shelf angles, extend flashing a minimum of 6-inches into masonry at each end.
4. At heads and sills, extend flashing 6-inches at ends and turn up not less than 2-inches to form end dams.
5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2-inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

E. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

F. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent tubing material to form weep holes.
2. Space weep holes formed from plastic tubing at 16-inches (1'-4") on center.
3. Install weep tubing flush with outside face of masonry; trim projections if required after mortar has set.

G. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material specified.

1. Install cavity drainage material continuous at weep and through-wall flashing locations along base of wall just above grade, at lintels over wall openings and at shelf angles of masonry cavity wall construction.
2. Place drainage net in continuous row snug in cavities direct over through-wall flashing at specified locations. Install material to fit between interior face of outer masonry wythe and cavity wall insulation or inner masonry wythe where insulation is not installed.
3. Coordinate placement with weep installation to maintain adequate drainage of cavities.

3.13 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 other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

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 ACI 530.1/ASCE 6/TMS 602 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 60-inches.

3.14 FIELD QUALITY CONTROL:

A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform specified field tests and inspections and prepare test reports.

1. Notify Owner, inspectors and testing agency in advance of when masonry construction will begin.
2. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections.
3. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections:

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Required Tests:

1. Mortar Testing: Mortar properties will be tested per ASTM C 780.
2. Grout Testing: Grout will be sampled and tested for compressive strength per ASTM C 1019.
3. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
4. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

3.15 REPAIRING AND POINTING:

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

3.16 FINAL CLEANING:

A. After mortar is thoroughly set and cured, clean exposed concrete unit masonry, architectural ground face concrete unit masonry and brick masonry as specified.

B. CMU Walls:

1. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
2. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Remove stains on concrete masonry surfaces by methods indicated in NCMA TEK 8-2A, as applicable.

C. Brick Masonry Walls:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on a sample wall panel at least 21 day in advance of performing cleaning operation.
    a. Should discoloration of masonry or mortar joints, staining or efflorescence appear on sample panel area notify Architect and await further instructions.
    b. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with specified masonry cleaning compound applied according to manufacturer's written instructions. Apply cleaning compound to masonry and flush with clean water.
    a. Do not perform wet cleaning within seven days of placing masonry.
    b. At least two hours prior to application of cleaning solution to masonry work, saturate mortar joints with clean water and flush off loose debris.
    c. Thoroughly wet walls before applying cleaning solution and thoroughly rinse walls afterward.

d. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 square feet maximum. Flush wall as cleaning progresses to prevent accumulation of scum.

e. Discard solutions containing debris and residue so not to contaminate adjacent areas.

f. Do not use high pressure to apply cleaning solution. Do not scrub mortar joints with cleaning solution.

g. Rinse masonry and surrounding surfaces immediately after cleaning with clear water.

6. Remove stains on brick masonry surfaces according with recommendations of the Brick Institute of America, "Technical Notes No. 20," dated June 2006. Apply cleaning agents only after testing on sample panel area.

3.17 MASONRY WASTE DISPOSAL:

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.

2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."

3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

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

END OF UNIT MASONRY

SECTION 047200

CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wall panels
2. Trim units.
3. Decorative elements. with engraved inscriptions
4. Accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

C. Samples:

1. For each color and texture of cast stone required, 4 inches (100 mm) square in size.
2. For each trim shape required, 4 inches (100 mm) in length.
3. For colored mortar.

1.4 INFORMATIONAL SUBMITTALS

A. Material test reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI or APA or PCI for Group A, Category AT.

PART 2 - PRODUCTS

2.1 CAST STONE UNITS

A. MANUFACTURERS
1. Rockcast a Reading Rock, Inc Company.
2. Olde World Cast Stone
3. Architectural Cast Stone, Inc

B. Cast Stone Units: Comply with ASTM C1364.

1. Units shall be manufactured using the manufacturer's selected method.
2. Wall Panels: Sizes as indicated on Drawings.

a. Engravings: As indicated on Drawings.

3. Trim units including

END OF SECTION 047200

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Description:

1. This section includes elements of the structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

2. This section does not include Miscellaneous Metal Fabrications.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.

2. All Structural Steel work on this project shall conform to the Construction Documents, applicable building code including referenced standards, and the requirements of AISC 360 “Specification for Structural Steel Buildings”, RCSC “Specification for Structural Joints Using High-Strength Bolts”, and AISC303 “Code of Standard Practice for Steel Buildings and Bridges” in coordination with clarifications, exemptions, and additions in the Construction Documents.

3. Division 05 Specifications – Steel Construction.

4. Division 09 Specification – Finishes

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172)..

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

D. Preinstallation Conference: Conduct conference at Project Site.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of the following connections required by the Construction Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a registered design professional licensed in the state in which the project is located, to withstand loads indicated and comply with other information and restrictions indicated.

1. Simple Shear Connections: Connections shall be selected or completed by an experienced steel detailer. Tables in the AISC Steel Construction Manual shall be used.

2. Connections other than Simple Shear Connections: Connections shall be designed by a registered design professional licensed in the state in which the project is located working for the fabricator.

3. Use ASD; data are given at service-load level.

4. Where beam shear is not noted, the connections shall develop the beam shear V = W/2 where W is the total allowable beam uniform load based on laterally supported simple span moments per tables located in the AISC Steel Construction Manual.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.

2. High-strength, bolt-nut-washer assemblies.

3. Shear stud connectors.

4. Anchor rods.

5. Threaded rods.

6. Forged-steel hardware.

7. Slide bearings.

8. Prefabricated building columns.

9. Shop primer.

10. Galvanized-steel primer.

11. Etching cleaner.

12. Galvanized repair paint.

13. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand-critical welds.
8. Identify members not to be shop primed.
9. Structural Steel Connections:
    a. Simple Shear Connections: Include substantiating connection information documenting the shear capacity of a minimum of (3) representative connection types on the project.
    b. Connections other than Simple Shear Connections: Include calculations signed and sealed by the registered design professional licensed in the state where the project is located, who is responsible for their preparation. Additionally, the registered design professional in responsible charge of the connection design shall review and confirm in writing that the approval documents properly incorporate the connection designs.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and Fabricator.

B. Welding certificates.

C. Material (Mill) test reports for structural steel, including chemical and physical properties.

D. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Steel headed stud anchors (shear connectors/shear studs).
5. Shop primers.

E. Source quality-control reports.

F. Survey of existing conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

C. All Structural Steel not receiving fire-proofing shall receive one shop coat of rust-inhibitive primer. All steel with exterior exposure shall be painted with a double coat of rust prohibitive epoxy primer (material and thickness to be specified by Architect) unless noted as galvanized or architecturally exposed structural steel.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Provide Structural Steel materials meeting the standards and grades set forth in the Construction Drawings.

2.2 BOLTS, CONNECTORS, AND ANCHOR RODS

A. Provide Bolts, Connectors, and Anchors of materials meeting the standards and grades set forth in the Construction Drawings.

2.3 SHRINKAGE-RESSISTANT GROUT

A. Provide shrinkage-resistant grout materials meeting the standards and grades set forth in the Construction Drawings.

2.4 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" and to AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermally cut, or punch holes perpendicular to steel surfaces. Do not free-hand thermally cut bolt holes or enlarge holes by burning.

D. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members only as indicated in Structural Construction Drawings.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not free-hand thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified in the Construction Drawings.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.6 PRIMER PAINT

A. Fabricator's standard rust-inhibiting grey primer. Do not prime steel that is to receive fire-proofing spray. Provide finish where indicated on Construction Drawings (see Architectural Drawings and Division 09 specifications).

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to Structural Steel according to ASTM A123.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize lintels, shelf angles, any framing exposed to earth or weather, and other framing as indicated in the Construction Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with Steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep Structural Steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent Structural Steel, connections, bracing, and diaphragms are in place unless otherwise indicated.

3.3 ERECTION

A. Set Structural Steel accurately in locations and to elevations indicated and in accordance with AISC 303 and AISC 360.

B. Base 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 base plate where indicated in Structural Construction Drawings.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of Structural Steel within AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Construction Drawings.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. 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 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified in the Construction Drawings.

B. Weld Connections: Comply with AWS D1.1 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 where indicated, 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 ANSI/AISC 303 for mill material.

3.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 051200

SECTION 052100

STEEL JOISTS FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Description:

1. This section includes: K-series steel joists, KCS-type K-series steel joists, and joist accessories.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.

2. All Structural Steel Joist and Joist Girder work on this project shall conform to the Construction Documents, applicable building code including referenced standards, and the requirements of Steel Joist Institute's (SJI) "Standard Specification", "Load Tables, and Weight Tables for Steel Joists and Joist Girders", and "Code of Standard Practice for Steel Joists and Joist Girders.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.

2. Division 09 Specification – Finishes

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Standard Specification."

B. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

C. SJI Specifications: Comply with standard specifications in SJI's "Standard Specification" that are applicable to types of joists indicated on Construction Drawings and/or Shop Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated on Construction Drawings and/or Shop Drawings.

B. Design special joists to withstand design loads with live load deflections no greater than the following:

1. Floor Joists: Vertical deflection of 1/360 of the span.

2. Roof Joists: Vertical deflection of 1/360 of the span.

1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product indicated on Construction Drawings and/or Shop Drawings.

B. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories, splice and connection locations and details, and attachments to other construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Standard Specification."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Standard Specification" for web and steel-angle chord members.

2.2 STEEL JOISTS AND ACCESSORIES

A. Shall conform to the applicable SJI “Standard Specification” and “Code of Standard Practice for Steel Joists and Joist Girders” for the joist series indicated on Construction Drawings and/or Shop Drawings.

2.3 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.4 CLEANING AND SHOP PAINTING

A. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Handle and install joists and accessories according to SJI Standard Specification and Recommended Code of Standard Practice for Steel Joists and Joist Girders for the joist series indicated on Construction Drawings and/or Shop Drawings.

3.3 REPAIRS AND PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, and accessories.

1. Clean and prepare surfaces, and apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 052100

SECTION 053100

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Description:

1. This section includes Roof Deck and Composite Floor Deck.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.

2. All Steel Deck work on this project shall conform to the Construction Documents, applicable building code including referenced standards, and the requirements of Steel Deck Institute's (SDI) "Standard Specification" and "Code of Standard Practice."

C. Related Sections:

1. Division 05 Specifications – Steel Construction.

2. Division 09 Specification – Finishes

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.4 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated on Construction Drawings and/or Shop Drawings.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Coordinate additional requirements with Construction Drawing General Notes and plan notes.

2.2 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Coordinate additional requirements with Construction Drawing General Notes and plan notes.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Self-drilling tapping screws that are in compliance with ASTM C1513 and that have been tested in accordance with AISI standards S904 and S905.

C. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of same material and finish as deck; of profile indicated or required for application.

D. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

E. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Flat Sump Plate: Single-piece steel sheet of same material and finish as deck. For drains, cut holes in the field.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install deck with corrugations running perpendicular to supports. Deck sheet shall be supported by a minimum of four supports (three span condition).

3.3 ROOF-DECK INSTALLATION

A. Miscellaneous Roof-Deck Accessories: Install roof sump pans, sump plates, ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

3.4 FLOOR-DECK INSTALLATION

A. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

B. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000

COLD-FORMED STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing
2. Roof rafter framing
3. Ceiling joist framing.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
2. All Cold-Formed Steel Framing work on this project shall confirm to the Construction Documents, applicable building code including referenced standards, and the requirements of AISI S100 “North American Specification for the Design of Cold-formed Steel Structural Members”, AISI S240 “North American Standard for Cold-formed Steel Structural Framing”, and AISI S202 “Code of Standard Practice for Cold-formed Steel Structural Framing” in coordination with clarifications, exemptions, and additions in the Construction Documents.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.

1.3 QUALITY ASSURANCE

A. Framing members shall be manufactured and supplied by one manufacturer and be of the type and size as indicated on Construction Drawings and/or Shop Drawings.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

C. Welding: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code–Steel,” and AWS D1.3, “Structural Welding Code–Sheet Steel.”

D. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory indicated.

B. Shop Drawings: Submit Shop Drawings showing fabrication and erection procedures. Shop Drawing (if indicated as a requirement by this specification) shall bear the seal of a registered design professional licensed in the state in which the project is located.

1. Show locations, sizes, gauges, spacing and types of framing composites, details of connections and framing of windows, doors and punched openings.

2. Indicate all prefabricated framing with individual panels shown for each condition. Indicate member properties, details of connections, all erection and permanent bracing required.

3. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for installation.

4. Shop Drawings shall indicate sequence and method of erection details of all connection of cold-formed steel framing to other elements of the building structure.

5. Indicate shop and field assembly details, including cut and connections.

6. Indicate type and location of welds, bolts, and fastening devices.

C. Delegated-Design Submittal: For work indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the registered design professional responsible for their preparation.

D. Structural design calculations: Indicate compliance with specified design criteria. Calculations shall bear the seal of a registered design professional licensed in the state in which the project is located.

1.5 INFORMATION SUBMITTALS

A. Welding certificates.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed steel framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed steel framing that may be incorporated into the Work include the following:

1. Clark Dietrich Building Systems
2. Marino\Ware
3. Cemco Steel

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Employ a qualified design professional, licensed in the state in which the project is located, to perform design and prepare signed and sealed Shop Drawings and Calculations for submittal. Comply with design intent, criteria, and requirements of the Construction Documents.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated in the Construction Documents.

1. Design Loads: As indicated in the Construction Documents.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    a. Exterior Wall Framing: Horizontal deflection of L/600 for brick/stone veneer, L/360 for simulated stone walls or stucco finish and L/240 for EIFS or other flexible finishes.
    b. Floor Joist Framing: Vertical deflection of 1/480 for live loads and l/360 for total loads of the span.
    c. Roof Rafter Framing: Vertical deflection of 1/240 of the horizontally projected span.
    d. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.
3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as indicated in the Construction Documents.
4. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. In addition to design loads all cold-formed members shall be sized for the connection requirements of the cladding and/or framing which attaches to them, including but not limited to sheathing, paneling, doors, windows, louvers, minor canopies, and sun shades.

D. Existing Conditions: Inspect structure for compliance with specified erection tolerances.

E. Design and coordinate installation and location of anchors and inserts with structural system to which cold-formed steel framing is attached.

2.3 MATERIALS

A. Steel Sheet: ASTM A1003, Structural Grade, Type H, minimum 20 gauge, metallic coated, of grade and coating designation as follows:

1. Grade:

a. ST33H for 33 mil and 43 mil

b. ST50H for 54 mil, 68 mil, and 97 mil

2. Coating:

a. G60.

B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating: Not less than coating of connected element.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer’s standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.

2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer’s standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

C. Steel Box or Back-to-Back Headers: Manufacturer’s standard C-shapes and tracks used to form header beams, of web depths indicated or as required by design, unpunched, with stiffened flanges.

D. Vertical Deflection Clips: Manufacturer’s standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

E. 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 and lateral loads and transfer them to the primary structure.

F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure.
2. Inner Track: Of web depth indicated.

G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.5 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, unpunched and without splices.

2.6 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel joists, unpunched and without splices.

2.7 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel joists, unpunched and without splices.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

B. 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.

C. Welding Electrodes: Comply with AWS standards.

2.10 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true-to-line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed steel framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, or screw fastening, according to Shop Drawings and manufacturer’s requirements.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true-to-line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/4 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances in AISI S202 and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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 S202, and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true-to-line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. 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.

G. Handling and lifting of prefabricated panels or assemblies shall be done in a manner as to not cause distortion or damage in any member, or damage to any connection.

H. Loads placed on panels or assemblies during erection shall not exceed design loads.

I. Do not bridge building expansion and control joints with cold-formed steel framing. Independently frame both sides of joints.

J. If required, install insulation, specified in Division 07, 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.

K. 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 1/4 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 INSTALLATION OF LOAD-BEARING WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacing as follows:

1. Anchor Spacing: As required by design, but not to exceed 24 inches max, and within 3 inches of ends.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated or as required by design.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated or required by design.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.

2. Install runner tracks, jack studs, and cripple studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically at 48 inches. Decrease spacing as required by design. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.

2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.

3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated or as required by design.

1. Anchor Spacing: As required by design, but not to exceed 24 inches max, and within 3 inches of ends.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/4 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated or as required by design.

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-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to building structure.
4. In high seismic areas connect drift clips to cold formed steel framing 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. Decrease spacing as required by design. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track, or install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

1. Install solid blocking at 96-inch centers.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 INSTALLATION OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with required end bearing.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: as indicated or as required by design.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals as indicated or as required by design. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 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 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. Description:

1. This section includes items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.

2. All Metal Fabrication work on this project shall confirm to the Construction Documents and applicable building code including referenced standards.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.

2. Division 09 Specification – Finishes

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Field Measurements: Verify actual locations of walls and other construction contiguous with Metal Fabrications by field measurements before fabrication.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for Metal Fabrications.

1. Include plans, elevations, sections, and details of Metal Fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For Metal Fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 METAL MATERIALS

A. Provide Structural Steel materials meeting the standards and grades set forth in the Construction Drawings.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. Provide Bolts, Connectors, and Anchors materials meeting the standards and grades set forth in the Construction Drawings.

2.4 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated.

1. Provide mitered and welded units at corners.

2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. Galvanize shelf angles located in exterior walls.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe or as indicated in Architectural Drawings.

1. Cap bollards with 1/4-inch thick steel plate when not filled with concrete.

2. Where bollards are indicated to receive controls for door operators, provide necessary cutouts for controls and holes for wire.

3. Where bollards are indicated to receive light fixtures, provide necessary cutouts for fixtures and holes for wire.

4. See Architectural Drawings for requirements.

B. Coordinate bollard attachment (base plate or embedment) with Architectural Drawings.

2.9 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. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Galvanize loose steel lintels located in exterior walls.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete where indicated on Architectural Drawings.

B. Anchor bollards as indicated in Architectural Drawings.

3.4 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.

END OF SECTION 055000

SECTION 055100

METAL STAIRS

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. Description:

1. This section includes materials, fabrication, and installation of Metal Stairs which are not specified elsewhere.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.

2. All Metal Stair work on this project shall confirm to the Construction Documents and applicable building code including referenced standards.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.

2. Division 09 Specification – Finishes

1.3 QUALITY ASSURANCE

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

B. Welding Qualifications - Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

C. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

D. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

E. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a registered design professional licensed in the state in which the project is located, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 psf
2. Concentrated Load: 300 lb applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:
   a. Uniform Load: 50 lb/ft applied in any direction.
   b. Concentrated Load: 200 lb applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Intermediate rails, infill of guards, and panel fillers:
   a. Concentrated Load: 50 lb applied horizontally on an area of 1 sq. ft.
   b. Infill load and other loads need not be assumed to act concurrently.

D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to General Notes of the Construction Drawings.

1. Component Importance Factor is 1.5.

1.5 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the registered design professional licensed in the state in which the project is located responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, [either commercial steel, Type B, or] structural steel, Grade 25, unless another grade is required by design loads; exposed.

C. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, [either commercial steel, Type B, or] structural steel, Grade 30, unless another grade is required by design loads.

D. Galvanized Steel Sheet: ASTM A653/A653M, G90 coating, [either commercial steel, Type B, or] structural steel, Grade 33, unless another grade is required by design loads.

2.2 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

2.3 PRECAST CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements in Division 03 specifications for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.

B. Reinforcing as required for design. Coordinate with Division 03 specifications.

2.4 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.5 STEEL-FRAMED STAIRS

A. Stair Framing:

1. Fabricate stringers of steel channels or tubes.

a. Provide closures for exposed ends of channel or tube stringers.

b. Size stringers for loads and also to be compatible in design and detailing with any attached railing. Where railing posts are attached to top flange of stringer, the stringer flange width shall not be less than the outside dimension of the post plus the welds required on each side for strength. Provide stiffeners in stringer as required for strength at base of post.

2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements

3. Weld stringers to headers; weld framing members to stringers and headers.

4. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 14 gauge steel.

C. Metal Floor Plate Stairs: Form treads and platforms to configurations shown from floor plate of thickness needed to comply with performance requirements, but not less than 1/4 inch.

D. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

2.6 STAIR RAILINGS

A. Comply with applicable requirements in Division 05 Section "Pipe and Tube Railings."

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion where paint will be used.

2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors. Furnish inserts and anchoring devices which must be preset in concrete on a timely basis to avoid delay in the work.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Fit exposed connections together to form tight hairline joints. Field weld connections which cannot be shop-welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat.

END OF SECTION 055100

SECTION 055213
PIPE AND TUBE RAILINGS

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. Aluminum pipe and tube railings for installation at the following locations:
      a. Exterior of building, including exterior stair.
      b. Outdoor site areas.
   2. Aluminum gate for installation at exterior stair.
   3. Stainless handrails for interior installation at stairs.

B. Related Section:
   1. Division 5 Section – "Metal Stairs" for interior steel railings associated with interiors metal stair fabrication work.
   2. Division 5 Section – "Wire Mesh Infill Panels in Railing Systems" for stainless steel tube handrails associated with metal wire mesh infill panel system.

1.3 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards and Mesh Panel System:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Design handrails and railings that allow for thermal movements resulting from specified maximum change (range) in ambient and surface temperatures without buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

   1. Temperature Change: 120-deg F, ambient; 180-deg F, material surfaces.
   2. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.4 SUBMITTALS:

A. Product Data: Submit data for the following:
   1. Railing brackets.
   2. Grout and anchoring cement products.
   3. Infill metal panels with railing system. Infill mesh panel design. Basis of Design is McNichols wire mesh system.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Show anchorage and accessory items.
   2. Indicate that the qualified professional engineer responsible for preparing structural analysis has reviewed shop drawings.

C. Structural Analysis: Submit for railings and handrails indicating compliance with specified performance requirements, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples:
   1. Railing: Submit 6-inch sections of each distinctly different linear railing member, including handrails, top rails and posts.
   2. Fittings and brackets: Submit for each type required for installation.

E. Qualification Data: Submit for qualified professional engineer and for fabricator to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified. (Submit for Architect's information only.)

F. Welding Certificates: Submit welders' certificates for personnel performing the work complying with qualification requirements. Certificates shall be current within the previous twelve (12) months. (Submit for Architect's information only.)

G. Paint Compatibility Certificates: Submit written approval from manufacturers of topcoats to be applied over shop primers certifying that shop primers are compatible with topcoat material. (Submit for Architect's information only.)

1.5 QUALITY ASSURANCE:

A. Fabricator Qualifications: Fabricator shall have minimum Five (5) years experience in the successful production and installation of railings and handrails of similar design and complexity as indicated for this Project.

B. Professional Engineer Qualifications: A professional engineer legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated for the installation of railings and handrails similar in material, design, and extent to those required for this Project with a record of successful in-service performance. Engineer's service shall include review of shop drawings.

C. Welder Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

D. Source Limitations: Obtain railings from a single source.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to job site undamaged and protected.

B. Store materials above ground in a clean, dry location and protected to avoid damages. Cover with waterproof covering with provisions for adequate air circulation.

C. Handle materials, exercising particular care to prevent damage to prefinished components; keep handling to a minimum.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION:

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METAL QUALITY:

A. Metal Surface Appearance: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.2 ALUMINUM:

A. Aluminum Alloy and Temper Requirements: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Tubing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210 (ASTM B 210M), Alloy 6063-T832.

E. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

G. Brackets and Flanges: Cast or extruded aluminum of same finish as supported rails unless otherwise indicated. Brackets shall be sized to provide minimum 1-1/2 inch clearance from inside face of handrail to finished wall surface when installed in place.

2.3 STAINLESS STEEL:

A. Stainless Steel Tubing: ASTM A 554, Grade MT 304.

B. Handrail Brackets, Flanges, and Anchors: Cast or formed stainless steel of same finish as supported rails unless otherwise indicated. Brackets shall be sized to provide minimum 1-1/2 inch clearance from inside face of handrail to finished wall surface when installed in place. Provide wall brackets comparable to Julius Blum & Company, Inc., model no. 275.

2.4 FASTENERS AND ANCHORS:

A. Fasteners:
1. Fastener Types:
a. For Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
b. For Interconnecting Railing Components:
1) Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2) Provide Phillips flat-head machine screws for exposed fasteners unless otherwise indicated.
2. Fastener Materials and Finishes: Type 304 or Type 316 stainless-steel fasteners.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors with alloy Group 1 or Group 2 stainless-steel bolts meeting ASTM F 593, and nuts meeting ASTM F 594. Anchors shall be capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS:

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded. Provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Shop Primers: Provide primers that comply with Division 9 Section - "Painting" for type metal surfaces to be painted.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound designed for exterior applications.
   1. Water-Resistant Product: Product shall be of formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.
   2. Compressive Strength: 7000 psi (48.2MPa), minimum, at 28-days when tested according to ASTM C109.

2.6 FABRICATION:

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly.
   1. Disassemble units only as necessary for shipping and handling limitations.
   2. Clearly mark units for reassembly and coordinated installation.
   3. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Welded Connections: Fabricate railings with welded connections unless otherwise indicated. Cope components at connections to provide close fit, or use fittings designed for this purpose.
   1. Weld all around at connections, including at fittings.
   2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

3. Obtain fusion without undercut or overlap.
4. Remove flux immediately.
5. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

H. Form changes in direction by radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

I. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

J. Close exposed ends of railing members with prefabricated end fittings.

K. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4-inch or less.

L. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

N. Fabricate railing posts for setting in concrete with sleeved, formed or core-drilled holes used as method for anchorage.

O. Exterior Stair Gate: Fabricate gate, including framed opening, from aluminum tube sections of sizes and shapes as detailed.
1. Provide with cam type self-closing hinges for fastening to jamb frame designed to receive gate mounting.
2. Fabricate jamb frame of gate opening on strike side with overlapping stop equipped with rubber bumper to prevent gate from opening in direction opposite egress.
3. Coordinate and prep gate fabrication to receive exit hardware specified in Division 8 – "Door Hardware."

P. Stainless Steel Handrails: Fabricate from specified stainless steel tubing material for mounting to wall construction at stairs and ramps located in Council Chamber.

2.7 FINISHES:

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples.
1. Noticeable variations in the same piece are unacceptable.
2. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

B. Aluminum Finishes:

1. Exterior Building Railings, including Gate: Color anodized finish complying with AAMA 611; AA-M12C22A42/A44, Class I, minimum 0.70 mils (0.018 mm) coating thickness. Color shall be as selected by Architect from full range of industry colors and color densities.

2. Outdoor Site Railings: Clear anodized finish complying with AAMA 611; AA-M12C22A41, Class I, minimum 0.70 mils (0.018 mm) coating thickness.

C. Stainless Steel Railing Finish: No. 6 dull satin finish (240-grit polished finish).
1. Remove tool and die marks and stretch lines, or blend into finish.
2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
3. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16-inch in 3-feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4-inch in 12-feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials. Coat concealed surfaces of aluminum with a heavy coat of bituminous paint that will come in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS:

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections as specified for fabrication whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2-inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6-inches of post.

3.3 ANCHORING POSTS:

A. Anchor posts to concrete construction by either of the following methods specified:
1. Preset Pipe Sleeves: Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with anchoring cement as specified.
2. Formed or Core-Drilled Holes: Form or core-drill holes not less than 5-inches deep and 3/4-inch larger than outside diameter (OD) of post for installing posts in concrete. After posts are inserted in holes, fill annular space between post and concrete with anchoring cement as specified.

B. Anchoring Cement Installation: Mix and place to comply with anchoring material manufacturer's written instructions.
1. Clean holes of loose material, insert posts, and fill annular space between post and concrete with prepared anchoring cement.
2. Fill annular space leaving 1/8-inch approximate recess for capping with sealant.
3. Caulk around joint of post set in anchoring cement with urethane sealant specified in Division 7 - Section - "Joint Sealants." Apply sealant with 1/8-inch buildup and troweled smooth to form slope away from post.

C. Anchor posts attached to metal substrates with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members. Weld flanges to post and bolt to metal supporting surfaces.

3.4 ATTACHING RAILINGS:

A. Anchor railing ends at walls with round flanges anchored to wall construction with concealed anchors and connected to railing ends using nonwelded connections.

B. Attach handrails to wall with wall brackets.
1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Install brackets to provide not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface.

C. Secure wall brackets to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use either of the following methods:
a. Attach with self-tapping screws or through-bolts fastened to steel framing or to concealed heavy gauge steel plate reinforcements.

b. Attach with hanger bolts or lag bolts set in fire-retardant-treated wood blocking located between studs. Coordinate location of blocking members with stud installation.

3.5 CLEANING AND PROTECTION:

A. Clean aluminum and stainless steel railings by washing thoroughly with clean water and soap and rinsing with clean water.

B. Protect finishes of railings and handrails from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF PIPE AND TUBE RAILINGS

SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Roof sheathing.

C. Roof-mounted curbs.

D. Roofing nailers.

E. Roofing cant strips.

F. Preservative treated wood materials.

G. Fire retardant treated wood materials.

H. Communications and electrical room mounting boards.

I. Concealed wood blocking, nailers, and supports.

J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

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

B. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

C. Section 05 3100 - Steel Deck.

D. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

E. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings, and self-adhered membrane flashing over sheathing.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

F. PS 1 - Structural Plywood; 2023.

G. PS 20 - American Softwood Lumber Standard; 2021.

H. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; 2019.

I. SPIB (GR) - Standard Grading Rules; 2021.

J. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2018.

K. WWPA G-5 - Western Lumber Grading Rules; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

D. Submit proposed screw pattern layout for roof sheathing attachment, such that designed roof system meets 1-90 Wind Uplift Requirements.

E. Submit data sheets and samples of all fasteners.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. Northeastern Lumber Manufacturer's Association (NeLMA).
   2. National Lumber Grades Authority (NLGA).
   3. Redwood Inspection Service (RIS).
   4. Southern Pine Inspection Bureau (SPIB).
   5. West Coast Lumber Inspection Bureau (WCLIB).
   6. Western Wood Products Association (WWPA).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Allowed under referenced grading rules.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
   1. Machine stress-rated (MSR) as follows:
      a. Fb-single; minimum extreme fiber stress in bending: 1350 psi.
      b. E; minimum modulus of elasticity: 1,300,000 psi.
   2. Species: Southern Pine, No. 2.
   3. Extent: As required, or indicated.

F. Roof Sleepers (1 by 4 inches).
   1. Species: Southern Yellow Pine.
   2. Grade: Construction or No. 2.
   3. Extent: Roof "Sleepers", and elsewhere as required or indicated.

G. For Structural Framing, 5 inches and wider, provide the following grade and species:
   1. "No. 2" grade, Stress Rated, with the following minimum properties:
      a. Fb = As indicated in Design Values for Wood Construction - NDS Supplement By The American Wood Council, LATEST Edition.
      b. E = As indicated in Design Values for Wood Construction - NDS Supplement By The American Wood Council, LATEST Edition.
   2. Species: Southern Yellow Pine.

H. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 EXPOSED BOARDS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.

B. Moisture Content: Kiln-dry (15 percent maximum).

C. Surfacing: S4S.

D. Species: Southern Pine.

E. Grade: No. 2, 2 Common, or Construction.

2.04 CONSTRUCTION PANELS

A. Roof Sheathing: Fiberglass mat faced gypsum panel, with water resistant gypsum core. ASTM C1177/C1177M, square long edges, 5/8 inch Type X fire-resistant, unless otherwise indicated.
1. GAF; Dens-Deck Prime Roof Board: www.gaf.com.
2. Georgia-Pacific Gypsum LLC; DensDeck Prime Roof Board: www.densdeck.com.
3. USG: Securock: www.usg.com
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Communications and Electrical Room Mounting Boards: UL verified fire retardant backboard: A-C plywood; 3/4 inch thick; Coated with UL Classified Fire Retardant Latex (Class "A" Rated). Tested to UL723 (ASTM E84) standards. Color: As selected by Architect from manufacturer's standard colors.
1. Pre-Manufacturered Product:
a. WoodBacker "Fire Retardant Backboards"; [Basis of Design]: www.woodbacker.com.
b. U-TECK; Fire Retardant Backboard: www.uteck.com
c. Readyspec Backboards, Inc; Fire Retardant Backboard: www.pathways-spaces.com/
d. Substitutions: See Section 01 6000 - Product Requirements.

C. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
3. Other Locations: PS 1, C-D Plugged or better.

2.05 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: AISI Type 304 or 316 Stainless steel for fire-retardant wood and preservative-treated wood locations; hot-dipped galvanized steel per ASTM A 153/ A 153M for rough carpentry exposed to weather, in ground contact, or area of high relative humidity; unfinished steel elsewhere. Acceptable to manufacturer of wood treatment materials and manufacturer of fasteners.
2. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Metal Framing Anchors:
1. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
a. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
b. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehnsive testing performed by a qualified independent testing laboratory.
2. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G90 and with ASTM A 446, Grade A (structural

quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

a. Use galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and all other locations, and at every point of bearing.
b. Minimum Thickness: 18-gauge.

C. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Panel Sheathing Clips: Provide panel sheathing clips in quantity and location recommended by manufacturer. For use for all unsupported edges. Simpson Stong-Tie Panel Sheathing Clips PSCA, 20 gauge, galvanized. Substitutions: Section 01 6000 - Product Requirements.

E. Nails, Wire, and Brads: FS FF-N-105.

F. Power Driven Fasteners (screws): National Evalution Report NER-272.

G. Wood Screws: ANSI B18.6.1.

H. Lag Bolts: ANSI B18.2.1.

I. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

J. Anchors shall be manufactured by American manufacturer.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in direct contact with the ground.
2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. All interior rough carpentry items in buildings of Type I or Type II construction are to be fire retardant treated.
c. All concealed wood blocking, framing and sheathing in buildings of Type I or Type II construction shall be fire retardant treated.
d. Review Life Safety Sheets and provide fire retardant treated wood blocking in all rated walls.
e. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

a. Treat lumber exposed to weather.
2. Treat lumber in contact with roofing, flashing, or waterproofing.
3. Treat lumber in contact with masonry or concrete.
4. Treat lumber less than 18 inches above grade.
   a. Treat lumber in other locations as indicated.
5. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
   a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
   b. Treat plywood in contact with roofing, flashing, or waterproofing.
   c. Treat plywood in contact with masonry or concrete.
   d. Treat plywood less than 18 inches above grade.
   e. Treat plywood in other locations as indicated.

D. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
1. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
2. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

2.07 ENGINEERED WOOD PRODUCTS

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Lab casework.
   3. Wall brackets.
   4. Handrails.
   5. Grab bars.
   6. Towel and bath accessories.
   7. Wall-mounted door stops.
   8. Chalkboards and marker boards.
   9. Wall paneling and trim.
   10. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members, unless tongue and groove sheathing is used.
   2. Provide sheathing clips at all unsupported edges.
   3. Screw panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 5000.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

SECTION 06 4000
CUSTOM ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Laminate clad countertops and cabinets, solid surface countertops and associated components, window sills, trim, similar work, and associated hardware.

B. Contractor's Option for fabricated Millwork in lieu of Laminate Casework: The General Contractor may, at its option, furnish and install Custom Architectural Woodwork in lieu of the specified Casework units. Where the General Contractor exercises this option, it shall demonstrate that the Custom Architectural Woodwork (Millwork) is in compliance with the requirements of this Section and is materially similar to the corresponding Casework item specified in Section 12 3219 - Laminate Casework.

1.02 SECTION INCLUDES

A. Laminate clad countertops.

B. Laminate covered cabinets (Contractor's Option to Section 12 3219 - Laminate Casework).

C. Wood cabinets, desks, and paneling.

D. Solid surface countertops, backsplashes, trim, wall caps & window sills, and vertical panels where indicated.

E. Manufactured quartz solid surface countertop, backsplashes and trim, where indicated; and vertical panels, where indicated.

F. Closet and utility shelving (paint on site, under Section 09 9100 - Painting).

G. Wood frames, sidelights, panels, base, window sills, and miscellaneous trim (paint on site, under Section 09 9100), stained (transparent finish) or painted (opaque finish) where indicated.

H. Hardware for architectural woodwork.

I. Related work and trim for above items.

J. Extent of each type of architectural woodwork is indicated on drawings and in schedules.

K. Architectural woodwork and components for opaque finish are intended to be finish painted on-site, under Section 09 9100 - Painting.

L. Architectural woodwork and components for natural, stained and/or transparent finish are intended to be painted in woodwork fabricator's shop under controlled conditions, under the work of this Section.

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:
1. Section 06 1000 - Rough Carpentry.
2. Section 06 2000 - Finish Carpentry.
3. Section 07 9005 - Joint Sealers.
4. Section 08 1416 - Flush Wood Doors.
5. Section 09 6623 - Resinous Matrix Terrazzo Flooring.
6. Section 09 9100 - Painting.
7. Section 12 3219 - Laminate Casework - Basis of Design where identified.
8. Division 22 Plumbing Sections: Countertops for sinks.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for Submittal procedures.

B. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices, blocking requirements and other components.

1. Manufacturer's current and complete product data, for manufactured units of work, including color selection data, samples, anchorage systems, installation method, transition & accessory types.
2. Keying schedule.

C. Samples: Submit the following samples:
1. Lumber and panel products with or for transparent finish; 6-inches x 3/4-inch x 18-inches, for each species and cut, finished on 1-side and 1-edge. Also submit two 3 by 3 inch samples with finish on 1-side.
2. Cabinet Hardware: One unit of each type and finish, which will be returned for use on the project, upon request by the Contractor.
3. Quartz Solid Surface: Manufacturer's standard samples, approximately 6-inches x 6-inches with finish as required for this project, and representative color range anticipated.
4. Solid Surfacing Products: Manufacturer's standard samples, approximately 4-inches x 4-inches, with finish as required for this project, and representative color range anticipated.
5. Laminate Products: Manufacturer's standard samples, approximately 4-inches x 4-inches, with finish as required for this project, and representative color range anticipated.

1.05 QUALITY ASSURANCE

A. AWS: Comply with applicable requirements of "Architectural Woodwork Standards" published by the Architectural Woodwork Standards, 2nd Edition, October, 2014.

B. Fabricator Qualifications: Fabricators shall be experienced firms specializing in the types of architectural woodwork required for this project for at least 5-verifiable years and on at least 10-verifiable projects of similar size, scope, complexity, and quality as this project.
1. Quartz Fabricator: 5-years and 10-verifiable projects.
2. Solid Surfacing Fabricator: 5-years and 10-verifiable projects.

C. Installer Qualifications: Arrange for installation of architectural woodwork by the fabricator, or by a firm under the control and direction of the fabricator, which can demonstrate at least 5-verifiable years successful experience in installing architectural woodwork items on at least 5-verifiable projects, similar in type and quality to those required for this project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.07 PROJECT CONDITIONS

A. Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0-percent tolerance of optimum moisture content, from date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Laminate Clad and Wood Cabinet Manufacturers: Subject to compliance with requirements, provide premium grade, custom made cabinets and woodwork from a millwork shop complying with requirements of "Quality Assurance" article above.

B. Plastic Laminate Manufacturer:
1. See Finish Legend for Manufacturers and colors.

C. Quartz-Surfacing Material: Subject to compliance with requirements, provide quartz countertop material of one the following. Color and finish indicated in drawings:
   1. Cambria: www.cambriaUSA.com [Basis of Design]
   2. CaesarStone: www.caesarstoneUS.com.
   3. Hanstone: www.hanwhasurfaces.com.
   4. Silestone: www.silestoneusa.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

D. Solid-Surfacing Material/Manufacturer: Homogeneous solid sheets of cast, filled acrylic resin complying with material and performance requirements in ANSI Z124.3, for Type 6.
   1. See Finish Legend for manufacturers and colors.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated with dowel, dado, glue and screw construction, with openings and mortises precut, where possible, to receive hardware and other items and work.
   1. Ease edges to a 1/16-inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1-inch in nominal thickness, 1/8-inch radius for edges of rails and similar members over 1-inch in nominal thickness.

C. Complete fabrication, assembly, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.

E. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit. A tight fit of less than 1/8-inch is expected.

F. Products in this Section shall be constructed only of materials that are formaldehyde-free.

2.03 FIRE-RETARDANT MATERIALS

A. Where fire-retardant treated lumber is indicated, provide materials which are pressure impregnated with fire-retardant chemicals and comply with the following requirements:
   1. As required to comply with referenced standards and finish classifications necessary as per the Standard Building Code, NFPA 101 - Life Safety Code, authorities having jurisdiction, and acceptable in all respects for indoor use and finish requirements.
   2. Fire-Retardant Chemicals: Use chemicals of type and for applications indicated which do not bleed-through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.

B. Fire Performance Characteristics: Provide materials which are identical to those tested per ASTM methods and time periods indicated, are marked and listed for fire performance characteristics by Underwriters Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction, and comply with the following requirements:
   1. Mill lumber after treatment, within limits set for wood removal which does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting agency.

C. Marking: Identify treated lumber with separable paper classification marking of inspecting and testing agency, unless otherwise indicated.

D. Surface Burning Characteristics: Not exceeding values required by latest edition of the "Standard Building Code" and "NFPA 101" (with amendments), tested per ASTM E 84 for standard time period.
   1. Flame Spread: Per Code.
   2. Smoke Developed: Per Code.

E. Kiln-dry woodwork after treatment to levels required for non-fire-retardant treated woodwork materials. Maintain moisture content required by kiln drying, before and after treatment.
   1. Discard treated lumber which does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

2.04 STANDING AND RUNNING TRIM

A. Quality Standard: Comply with AWS Section 6 - Interior Millwork.

B. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.

C. Assemble Casings in plant except where limitations of access to place of installation require field assembly.

D. Interior Trim for Transparent Finish (typical finish unless specifically indicated otherwise): Comply with the following requirements:
   1. Grade: Premium, Grade I.
   2. Lumber Species: See Finish Legend.
   3. Cut: See Finish Legend.
   4. Locations: Provide stained transparent finish within rooms which have new woodwork with transparent finish, at indicated areas. Refer to Elevations & Finish Schedule.

E. Interior Trim for Opaque Finish (only where specifically indicated, if any): Comply with the following requirements:
   1. Grade: Custom. Grade II.
   2. Lumber Species: Any closed-grain hardwood listed in referenced woodworking standard.
   3. Cut: Plain or Rotary cut.
   4. Locations: Provide opaque finish within rooms which have new woodwork with opaque finish, unless indicated otherwise. Refer to Elevations and Finish Legend.

2.05 ARCHITECTURAL COUNTER TOPS

A. Quality Standard: Comply with AWS, Section 11-Countertops.

B. Type of Top - Laminate Clad:
   1. Grade: Premium; Grade I.
   2. Edge Treatment: Refer to Drawings.
   3. Core: Minimum 47-lb. density particle board, except at least 3/4-inch A-B plywood with exterior glue (approved for interior use), at tops with sinks and/or plumbing fixtures.
   4. Minimum Thickness: 1-1/4-inches at tops and 3/4-inch at splashes, unless indicated otherwise on the Drawings.

C. Types of Top (and/or panel): Solid Surfacing.
   1. Colors, Patterns and Finishes: As indicated, or if not indicated, as selected from any of manufacturer's standard finishes and colors.
   2. Edge Treatment: As indicated on the Drawings.
   3. Thickness - Tops and Substrates:
      a. Tops (and any flat vertical panels): 1/2-inch, 3/4-inch substrate & with 1-1/2-inch built-up edges unless indicated otherwise on the Drawings.
      b. Backsplash & Sidesplash: 1/2-inch.
      c. Edge Treatment: As indicated on the Drawings, or if not indicated, ease all exposed edges to 1/16" radius, and seam width of less than 1/8".
         1) DuPont-approved adhesive to create color-matched seam.

d. Substrates: Refer to the Drawings for thickness of plywood below solid surface tops, splashes, etc., or if not indicated, at least 3/4-inch thick at horizontal and sloped surfaces (and at least 1/2-inch thick at any vertical panels).

4. Allowable tolerances:
   a. Flat and true to within 1/8" of a flat surface over a 10' length.
   b. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.
   c. Variation in Component Size: 1/8" over a 10' length.
   d. Location of Openngs: 1/8" from indicated location.
5. Provide manufacturer's 10-year warranty against defects in materials.
   a. Warranty shall provide material to repair or replace defective materials.
   b. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
   c. The above warranty shall be in addition to, shall be in effect simultaneously with, and shall not limit or alter other project or product warranties or guarantees, nor shall it serve as limitation to other remedies available to the Owner.

2.06 FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWS Section 5, unless otherwise indicated.

B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

C. Interiors for wood cabinets: To match wood.

D. Melamine cladded interiors for wood cabinets: To match HPDL.

2.07 ARCHITECTURAL LAMINATE CLAD CABINETS

A. Quality Standard:
   1. Comply with AWS Section 10.
   2. Grade: Premium.
   3. Design: Flush overlay - Type A- Frameless construction.

B. Laminate Cladding: High pressure decorative laminate complying with NEMA LD 3 and as follows:
   1. Colors, Patterns and Finishes: As indicated or, if not otherwise indicated, as selected by Architect from laminate manufacturers' standard products in the following categories: Solid, stippled, textured, wood grain and/or patterned colors; Thru-color type.
   2. Provide specific types as scheduled.
      a. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      b. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      c. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      d. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      e. Flame Retardant Surfaces: HGF, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      f. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
      g. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

C. Hardboard: AHA A135.4 (tempered).

D. Melamine cladded interiors in laminate cabinets.

E. Core Materials:

1. MR Moisture Resistant Medium Density Fiberboard: Average 47-pound density grade, ANSI A208.2.

2.08 INTERIOR FRAMES AND JAMBS

A. Quality Standard: Comply with AWS Section 10.
   1. Grade: Premium.

B. Wood Species:
   1. For Opaque Finish: Any closed-grain hardwood listed in referenced woodworking standard.
   2. For Transparent Finish (stained): Match wood doors.

C. Fire Rated Frames:
   1. 20 min and 45 min rated types. Refer to Door Schedule.

D. Jamb Type: Flat jamb, unless indicated otherwise.

2.09 FASTENERS AND ANCHORS

A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot- dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.10 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items which are specified in Section 08 7100 - Finish Hardware.

B. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

C. Hardware Finishes: Comply with BHMA 1301 for finishes indicated by BHMA Code Numbers or if not otherwise indicated, provide finishes complying with requirements indicated.
   1. For exposed hardware comply with requirements indicated for finish and base indicated at the end of this Section.
   2. For concealed hardware provide manufacturer's standard finishes which comply with product class requirements of ANSI/BHMA A156.9, and which match exposed hardware on same cabinet unit.

2.11 COUNTERTOP SUPPORT

A. Countertop support brackets, undercounter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted. Color shall be as selected by Architect from manufacturer's standard colors.
   1. Support brackets shall be equal to Rakks EH Counter Support Bracket unless otherwise noted.
      a. For concealed support, provide Inside Wall Flush-Mount bracket.

2.12 CABINET HARDWARE

A. Cabinet Hinges: 170-degrees adjustable "CLIP System" concealed self-closing hinges as manufactured by Julius Blum, Inc., or equivalent by Grass or Stanley.
   1. Finish shall match hardware finish specified in Section 08710 - Finish Hardware in room(s) where occurs.

B. Cabinet Door and Drawer Pulls:
   1. Wire pulls, equivalent to Stanley No. 4484, stainless steem (ANSI B12012), 4-inches long, with 1-inch clearance; unless indicated otherwise. Pull design shall comply with the Americans with Disability Act (ADA).
      a. Finish shall match hardware finish specified in Section 08 7100 - Finish Hardware.

C. Cabinet Door Catches: Manufacturer's standard 2-screw sill mounted unit made of molded nylon, lipped over sill to form bumper and hold in place, with 2-screw mounted heavy door mounted unit with nylon roller; provide spring-mounted units where required.
   1. Acceptable Manufacturers: Any of manufacturers listed for other cabinet hardware.

D. Cabinet Drawer Slides: Heavy Duty, non-corrosive (galvanized) full extension ball bearing slides rated at 100-pounds, with positive stop, and self-closing and lift-out disconnect features; Model No. 1429, as manufactured by Knape & Vogt, or equivalent by Blum or Grant.
   1. At legal size drawers, use K&V No. 1483 or equivalent, rated at 150-pounds, with same features as noted above.

E. Cabinet Shelf Standards: Manufacturer's standard steel units with anchors and supports 5/8-inch wide x 3/16-inch high, adjustable on 1/2-inch centers; Series 255, as manufactured by K&V, or equivalent by Grant or Stanley.
   1. Wood Cabinets: Model No. 255 BRN with No. 256 BRN supports and matching fasteners.
   2. Omit standards where fixed shelves are indicated.
   3. All standards to be recess mounted (flush in routed dados), unless specifically indicated otherwise.

F. Cabinet Locks: Provide cabinet manufacturer's standard 5-disc tumbler, cam type, keyed differently at each room for each file drawer & where indicated on drawings , with metal strike screwed to wood surface, and master keyed.
   1. Furnish 2-keys for each lock.
   2. Furnish 5-master keys
   3. Finish to match Section 08 7100 - Finish Hardware finish in room(s) where occurs.
   4. Location: Where indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

B. Pre-Installation Meeting: Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor; Architect and other Owner Representatives (if any); Installers of architectural woodwork, wet work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with woodwork installation only when everyone concerned agrees that required ambient conditions can be maintained.

C. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.
   1. Coordinate location and placement of concealed treated blocking (by others) prior to finish materials installations.

D. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWS Section 2, 6, 10, 11 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
   1. Seal all hardware cuts, routed slots, etc., before installation of hardware.

D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete

installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.

E. Bamboo Flooring (for vertical, and horizontal surfaces): Install in accordance with manufacturer's recommendations.

F. Standing and Running Trim, and Sills: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with referenced Quality Standards for joinery.

G. Cabinets: Install without distortion so that 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 the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.
   1. Install cabinets with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.

H. Tops: Anchor securely to base units and other support systems indicated. Caulk space between backsplash and wall with specified sealant.
   1. Install countertops with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.

I. Wood Panels: Anchor panels to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
   1. Install flush panels with no more than 1/16-inch in 96-inches vertical cup or bow and 1/8- inch in 96-inches horizontal variation from a true plane.

J. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

K. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.

L. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

M. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on brackets, and supports.
   1. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.

N. Install rod flanges for rods as indicated. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

O. Refer to Section 09 9100 - Painting, for final finishing of installed architectural woodwork which is indicated to be painted on-site.

3.03 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

D. Complete the finishing work specified as work of this section, to whatever extent not completed at shop or prior to installation of woodwork.

E. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

END OF SECTION

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SECTION 066116

SOLID SURFACING FABRICATIONS

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. Section Includes: Solid surfacing fabrications of designs indicated on drawings including, but not limited to window stools.

1.3 PERFORMANCE REQUIREMENTS:

A. Solid Surfacing Performance: Meeting requirements of the International Cast Polymer Alliance (ICPA) ANSI/ICPA SS-1, "Performance Standard for Solid Surfacing Materials."

B. Fire Performance: Meeting Class A (Class I) surface-burning characteristics as determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product literature indicating material, composition, finish and compliance with specified requirements. Include fabrication instructions.

B. Shop Drawings: Show solid surfacing fabrications in plan and elevations with large scale sections and details describing work.

1. Indicate dimensions, material thicknesses, locations, anchorage provisions and attachment methods.
2. Include fabrication and installation details.
3. Indicate adjacent and interfacing work.

C. Samples: Submit 3-inch by 3-inch (76 by 76 mm) sample of solid surfacing material indicating full range color, pattern variation and finish to be expected in completed installation.

D. Product Certificates: Signed by manufacturers of solid surfacing work certifying that products furnished comply with requirements. Submit for Architect's information only.

E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates. Submit for Architect's information only.

F. Qualification Data: For fabricator to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. Submit for Architect's information only.

G. Maintenance Data: Submit manufacturer's maintenance instructions for care and cleaning of material.

1. Indicate recommended cleaning products, maintenance and repair procedures.
2. Include as part of Contract Closeout documents.

1.5 QUALITY ASSURANCE:

A. Fabricator Qualifications: Fabricator shall be certified or approved by solid surfacing material manufacturer and participate in AWI's Quality Certification Program.

1. Shop shall employ skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
2. If requested, submit list of projects completed within the past three (3) years indicating project names and locations, names and addresses of architects and owners, and description of work.

B. Installer Qualifications: Fabricator of products or certified participant in AWI's Quality Certification Program.

C. Quality Standard: Comply with AWI's "Architectural Woodwork Standards," Edition 1, for grades of counter tops indicated for construction, fabrication, installation, and other requirements.

D. Single Source Limitations: Solid surfacing materials installed throughout Project shall be the products of a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver solid surfacing fabrications to project site in manufacturer's protective covering. Schedule delivery only after building is enclosed and spaces are ready for installation of fabricated items.

B. Store materials indoor off floor in dry conditioned spaces protected from damage, moisture, and soiling conditions.

C. Handle materials to prevent from physical damages. Protect surfaces from staining, scratching, abrading or marring during handling.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Take field measurement prior to preparation of shop drawings to ensure proper fitting of work. Allow provisions for adjustment and fitting as required.

1.8 COORDINATION:

A. Coordinate installation of plumbing fixtures and accessories to solid surfacing fabrications. Obtain templates or rough-in measurements provided by fixtures and accessories manufacturers for installation.

B. Coordinate locations and installations of anchors and support members which must be built-in to other work for countertop installation.

1.9 WARRANTY:

A. Material Warranty: Provide solid surfacing manufacturers' Ten (10) year warranty covering defects in materials. Warranty shall provide for repair or replacement of materials including labor charges. Warranty shall commence on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOLID SURFACING:

A. Solid Surfacing Material:

1. Acceptable Products; subject to compliance with specified requirements:
   a. Aristech Surfaces, LLC.; Avonite Foundations.
   b. E.I. Du Pont Company; Corian.
   c. LG Chem, Ltd.; Hi Macs.
   d. Swan Corporation; Swanstone.
   e. Wilsonart, LLC.; Solid Surface.
2. Characteristics:: Cast or molded, homogeneous, non-porous, filled acrylic polymer resin with fillers and pigments complying with ANSI/ICPA SS-1 and meeting specified performance requirements.
   a. Flammability: Complying with specified fire performance requirements.
   b. Thickness: 1/2-inch (13 mm), minimum.
   c. Colors and Patterns: As selected by Architect from manufacturer's full range colors and patterns.

B. Basis of Design: Solid surfacing product as scheduled on drawings.

1. Other specified solid surfacing products of similar material composition, construction, formulation, color, pattern, properties and quality may be submitted for Architect's acceptance.
2. Acceptance is subject to compliance with specified requirements as evidenced by submittal of manufacturer's product data and samples. Submitted solid surfacing material shall match color and pattern of basis of design product as judged by Architect.

C. Fabrication Designs: As indicated on drawings and including, but not limited to window stools.

2.2 ACCESSORY PRODUCTS:

A. Joint Adhesive: Manufacturer's standard one or two-part adhesive. Adhesive shall be type to create inconspicuous, non-porous joints and blend in with solid surfacing material.

B. Panel Adhesive: Manufacturer's standard neoprene-based adhesive meeting ANSI A136.1; UL Listed.

C. Sealant: Manufacturer's standard, FDA approved, mildew-resistant silicone sealant in colors matching components.

2.3 FABRICATION:

A. Shop fabricate solid surfacing components to greatest extent practicable within specified tolerances to sizes, profiles and shapes in accordance with approved shop drawings.

B. Fabricate countertops complying with AWI Premium Grade quality standard.

C. Fabricate components with exposed surfaces free of scratches, chips, marks or similar imperfections.

D. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints. Where joints will be unsupported, reinforce with minimum 2-inch wide solid polymer material.

E. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Repair or reject defective and inaccurate work.

F. Thermoform materials when required by fabrication method in accord with manufacturer's instructions.

1. Heat entire component to uniform temperatures as directed by manufacturer.
2. Form pieces to shape prior to seaming and joining.
3. Cut pieces to finished dimensions required.
4. Sand edges and remove nicks and scratches.

G. Fabricate window stools from 1/2-inch (13 mm) thickness solid surfacing material to sizes and profiles indicated for field application.

H. Allowable Fabrication Tolerances:

1. Sag or bow: Maximum 1/8-inch (3 mm) variation in total length.
2. Warp: Maximum plus or minus 1/8-inch (3 mm) variation, corner to corner.
3. Size: Maximum plus or minus 1/8-inch (3 mm) variation in length or width.
4. Thickness: Maximum plus or minus 1/32-inch (0.8 mm) variation.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install solid surfacing fabrications plumb, level and rigid to locations indicated in according to final reviewed shop drawings and manufacturer's product data.

B. Scribe and fit components to adjacent construction and finishes.

C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

D. Install window stools to locations secured to level substrates.

1. Cut and fit trim fabrications to sizes required to provide neat, tight joints with adjacent finishes and construction.
2. Adhere solid surfacing to substrates using manufacturer's recommended adhesive or color-matched silicone sealants.

E. Caulk perimeter joints of solid surfacing components abutting adjacent construction and finishes using specified silicone silicone.

3.2 CLEANING AND PROTECTION:

A. Handle solid surfacing components with clean hands during installation. Remove adhesives, sealants and other stains from surfaces, keeping installation clean as work progresses.

B. Provide protective covering over surfaces after installation to prevent from damages and stains as a result of work by other trades. Maintain protection in place until Date of Substantial Completion.

C. Just prior to Date of Substantial Completion, remove protective covering and clean surfaces. Follow solid surfacing material manufacturer's recommendations for cleaning and procedures for removing stains.

D. Examine surfaces for damages and permanent stains after cleaning.

1. Restore damaged or stained surfaces to be indistinguishable in finished work in accordance with solid surfacing material manufacturer's repair procedures.
2. If repair work is not satisfactory to Architect, replace entire unit or component at no additional cost to Owner.

END OF SOLID SURFACING FABRICATIONS

SECTION 071616

CRYSTALLINE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Crystalline waterproofing for application to interior surfaces of below grade elevator pit walls and floors.

B. Related Sections:
1. Division 3Section - "Cast-in-Place Concrete."
2. Division 7 Section - "Joint Sealants."
3. Division 14 Section – "Hydraulic Passenger Elevator."

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's material descriptions, and technical data indicating tested physical and performance properties of waterproofing material. Include construction details and installation instructions for crystalline waterproofing.

B. Qualification Data: Submit for applicator to demonstrate their capabilities and experience. Include certification by waterproofing manufacturer attesting to applicator's training and lists of completed projects with project names and addresses, architects and owners. Submit for Architect's information only.

C. Product Certificates: Submit manufacturer's certificates for waterproofing, patching, and plugging materials. Submit for Architect's information only.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for crystalline waterproofing. Submit for Architect's information only.

E. Field Quality-Control Reports: Submit inspection report prepared by waterproofing manufacturer's field representative verifying application of materials. Submit for Architect's information only.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Applicator shall be trained by manufacturer with not less than three-years' experience in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, with a record of successful in-service performance for application work.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.

B. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40-deg. F. or above during work and cure period, and space are well ventilated and kept free of water.

C. Substrate Conditions: Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

D. Work of Other Trades: Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed.

1.6 WARRANTY

A. Watertightness Warranty: Provide written warranty, signed by Installer and countersigned by Contractor agreeing to repair or replace waterproofing that does not comply with requirements or that fails to perform as required, and to maintain watertight conditions within Five (5) years from date of Substantial Completion.
   1. Warranty includes responsibility for removing and replacing other work that conceals crystalline waterproofing.
   2. During warranty period, repairs and replacements required because of unusual weather phenomena and other events beyond Contractor's or Installer's control shall be completed by Contractor or Installer and paid for by Owner at prevailing rates.

PART 2 - PRODUCTS

2.1 CRYSTALLINE WATERPROOFING MATERIALS

A. Acceptable Products; subject to compliance with requirements provide one of the following:
   1. Anti-Hydro International, Inc.; A-H Hydrocap.
   2. BASF Corporation; MasterSeal 500.
   3. Euclid Chemical Company; Hey'DI K-11.
   4. ICS Penetron International Ltd.; Penetron.
   5. Vandex USA LLC; Vandex Super.
   6. Xypex Chemical Corporation; Xypex.

B. Crystalline Waterproofing: Prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and concrete unit masonry and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate; that has VOC content complying with limits of authorities having jurisdiction; with properties

meeting or exceeding the criteria specified below.

1. Water Permeability: Maximum zero for water at 30 feet when tested according to CE CRD-C 48.
2. Compressive Strength: Minimum 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.2 ACCESSORY MATERIALS

A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

C. Portland Cement: ASTM C 150, Type I.

D. Sand: ASTM C 144.

E. Water: Potable.

2.3 MIXES

A. Crystalline Waterproofing Mix: Add prepackaged dry ingredients to water according to manufacturer's written instructions. Proportion and mix waterproofing compound with water as directed to achieve lump-free, homogeneous, blended slurry consistency.

1. Mix together with mechanical mixer or by hand to required consistency.
2. Do not over mix. After mixing is completed, do not re-temper mix.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.

B. Proceed with application only after unsatisfactory conditions have been corrected.

C. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

A. Protect other work from damage caused by cleaning, preparation, and application of

waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.

C. Stop active water leaks with plugging compound according to waterproofing manufacturer's written instructions.

D. Substrate Repairs: Repair damaged or unsatisfactory substrate with patching compound according to manufacturer's written instructions.
   1. Cut out holes, honeycombs, open joints, cracks, voids, tie holes and other defects in concrete substrate effecting application of waterproofing material.
      a. Remove loosened chips and cut or rout out defective areas to depth recommended by waterproofing manufacturer to reveal sound material.
      b. Cut reveal with sides perpendicular to surface, not tapered, and approximately 1-inch deep.
   2. Clean and prepare cut and routed out areas and fill with patching compound as recommended by waterproofing manufacturer. Fill reveal with patching compound flush with surface.

E. Surface Preparation: Comply with waterproofing manufacturer's written instructions to remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.
   1. Clean concrete surfaces according to ASTM D 4258.
      a. Etch scratch- and float-finished concrete with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260.
      b. Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.
   2. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.

3.3 APPLICATION

A. Comply with waterproofing manufacturer's written instructions for application and curing.
   1. Saturate surface with water for several hours prior to application and maintain damp condition until applying waterproofing. Remove standing water.
   2. Apply waterproofing to inside (negativeside) surfaces of elevator pit walls and floors.
   3. Number of Coats: Apply in number of coats required for specified water permeability but not less than two (2) coats.
   4. Application Method: Either brush or spray application as recommended by waterproofing manufacturer for substrate conditions encountered. Apply to ensure that each coat fills voids and is in full contact with substrate or previous coat.
   5. Dampen surface between coats.

B. Waterproofing Treatment Extensions: Extend waterproofing treatment into sump pits

located in elevator pit floors.

C. Final Coat Finish: Apply final coat in manner to achieve brushed or spray textured finish.

D. Curing: Moist-cure waterproofing for not less three days immediately after final coat has set, followed by air drying, unless otherwise recommended in writing by manufacturer. Cure by periodic fog spraying and cover with impervious sheeting or other method acceptable to waterproofing manufacturer until coating has set

3.4 PROTECTION

A. Protect applied crystalline waterproofing from rapid drying, severe weather exposure, water accumulation and frost.

B. Protect waterproofing from temperatures below 40-deg. F. Provide adequate ventilation where waterproofing is applied in enclosed spaces or pits to ensure suitable air circulation for duration recommended by manufacturer following treatment.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Engage waterproofing manufacturer's representative to inspect completed application and provide a written report that application complies with manufacturer's written instructions.
   1. Waterproofing manufacturer's representative shall inspect substrate and completed application of crystalline waterproofing to verify proper surface preparation and installation of their materials.
   2. Notify manufacturer's representative upon completion of surface preparation work and again after completion of waterproofing application to perform required inspections.
   3. Waterproofing manufacturer's representative shall provide written report indicating that substrate preparation and waterproofing application complies with manufacturer's written instructions.

END OF SECTION 071616

SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes:
1. Batt insulation.
2. Rigid foam board cavity wall insulation.
3. Composite foam board insulation.

B. Related Sections include the following:
1. Division 4 Section - "Unit Masonry."
2. Division 5 Section - "Cold-Formed Metal Framing."
3. Division 7 Section - "Hot Fluid-Applied Rubberized Asphalt Waterproofing."
4. Division 7 Section - "Fluid-Applied Membrane Air Barriers."
5. Division 7 Section - "Metal Soffit Panels."
6. Division 9 Section - "Gypsum Board Assemblies."
7. Division 23 Section - "HVAC Insulation."

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each type of insulation required, including installation instructions. Include data substantiating that the materials comply with specified requirements.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

C. Research/Evaluation Reports: For foam-plastic insulation complying with requirements of the International Building Code.

1.4 QUALITY ASSURANCE:

A. Source Limitations: Obtain each type of building insulation through one source and from a single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 BATT INSULATION:

A. Acceptable Manufacturers; subject to compliance with specified requirements:
1. CertainTeed Corporation.
2. Guardian Fiberglass Inc.
3. Johns Manville Corporation/Building Insulation Division.
4. Knauf Insulation.
5. Owens-Corning Fiberglas Corporation.

B. Type: Unfaced, fiberglass blanket insulation meeting ASTM C665, Type I.
1. Surface Burning Characteristics: Meeting Class A flame spread and smoke developed indexes specified when tested according to ASTM E84.
a. Flame Spread Index: Not more than 25.
b. Smoke Developed Index: Not more than 50.
2. Combustibility: Noncombustible when tested per ASTM E136.
3. Thermal Resistance and Thickness:
c. Walls: R-13 (13 deg F × h × sq. ft./Btu at 75 deg F) thermal resistance, 3-1/2 inch thickness; unless otherwise indicated.
d. Soffits: R-19 (19 deg F × h × sq. ft./Btu at 75 deg F) thermal resistance, 6-1/2 inch thickness; unless otherwise indicated.
4. Size: Manufacturer's standard width equal to spacing of framing members.

2.2 RIGID FOAM BOARD CAVITY WALL INSULATION

A. Acceptable Products; subject to compliance with specified requirements:
1. Diversifoam Products; CertiFoam 25 SE.
2. Dow Chemical Company, Styrofoam Scoreboard or Square Edge.
3. Owens-Corning, Foamular 250.
4. Kingspan Insulation, LLC; GreenGuard Type IV XPS Insulation Board.

B. Type: Extruded, closed cell polystyrene boards meeting ASTM C578, Type IV.
1. Compressive strength: 25 psi minimum, tested in accord with ASTM D1621.
2. Density: 1.6 pcf, minimum, tested in accord with ASTM C303.
3. Thermal Resistance: R-5.0 per inch (5.0 deg F x h x sq. ft./Btu at 75 deg F) when tested in accord with ASTM C518.

4. Surface Burning Characteristics: Meeting flame spread and smoke developed index specified when tested in accord with ASTM E84.
   a. Flame Spread Index: Not more than 25.
   b. Smoke Developed Index: Not more than 200.
5. Thickness: As indicated on Drawings.
6. Sizes: Manufacturer's standard.
7. Edges: Square.

2.3 COMPOSITE FOAM BOARD INSULATION MATERIALS

A. Composite Ventilated Polyisocyanurate Board Insulation with Wood or EPS Spacers and Oriented Strand Board (OSB) or Plywood: Rigid cellular foam with 1 inch wood or EPS spacers between foam and OSB or plywood; complying with ASTM C1289, Type II.

1. Top Layer Material: 7/16 inch (11 mm) oriented strand board (OSB), or 19/32 inch CDX plywood.
2. Compressive Strength: 20 psi, minimum.
3. Board Size: 48 x 96 inch.
4. Composite Insulation Board Thickness: as need to achieve R-value.
5. Airspace: 1.5”
6. Thermal Resistance: R-value of 20
7. Board Edges: Square.
8. Manufacturers:
   a. Atlas; ACFoam CrossVent Insulation Board [Basis of Design]; www.atlasroofing.com.
   b. GAF: www.gaf.com.
   c. Hunter Panels, LLC; Cool-Vent: www.hpanels.com.

2.4 AUXILIARY MATERIALS:

A. Fasteners and Supports: Type as recommended by insulation manufacturer for installation conditions encountered.

B. Adhesive for Bonding Foam Board Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates. Adhesives used with plastic foam insulation for installation in masonry cavity wall construction shall be type compatible with specified fluid-applied air barrier membrane.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

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

3.2 PREPARATION:

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Cut and fit insulation to maintain thermal integrity over areas indicated to be insulated.

3.3 GENERAL INSTALLATION REQUIREMENTS:

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 BATT INSULATION INSTALLATION:

A. Install specified batt insulation to exterior framed walls and other areas as indicated, with vapor barrier facing to building interior.
   1. Install batt insulation in uninterrupted continuous full height lengths.
   2. Friction fit batt insulation snug and tight between framing members.
   3. Install batt insulation with butted end joints as required and taped using specified foil-faced tape.
   4. Seal tears and holes in vapor barrier facing with foil-faced tape.

B. Insulate small areas between closely spaced framing members. Cut and fit insulation around pipes, conduits and other obstruction.

C. Where pipes or conduit are located in stud spaces, place insulation between exterior wall and pipe, compressing insulation where necessary.

D. Do not install insulation compressed in excess of 10-percent.

E. Provide supplemental support using wire ties fastened 24-inches on center, maximum to prevent sagging of insulation.

3.5 RIGID FOAM BOARD CAVITY WALL INSULATION INSTALLATION:

A. Install rigid foam insulation to sheathed metal framed wall construction erected to support masonry veneer only after Architect has inspected and approved application of fluid-applied air barrier membrane to substrates.

B. Install insulation in cavity air space over sheathing sealed with air barrier membrane of metal framed wall construction. Coordinate installation with attachment of anchors and ties.

C. Secure insulation to air barrier sealed gypsum sheathing attached to metal framed back-up wall construction using compatible adhesive as recommended by manufacturer.
   1. Place small dabs of adhesive, spaced approximately 12-inches on center in each direction, horizontal and vertical, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose.
   2. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions.
   3. Press units firmly against supporting substrates indicated.
   4. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and air barrier membrane applied over gypsum sheathing.

3.6 COMPOSITE FOAM BOARD INSULATION

A. Install nailbase insulation board in accordance with manufacturer's instructions.

3.7 PROTECTION:

A. Protect installed insulation material from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Remove and dispose of excess materials, litter and debris; leaving work areas in a clean condition.

END OF SECTION 072100

SECTION 072650

UNDER SLAB VAPOR BARRIER

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: Vapor barrier membrane for installation under concrete slabs on grade.

B. Related Sections:
   1. Division 2 Section "Earth Moving" for preparation of building pad and subbase.
   2. Division 3 Section "Cast-In-Place Concrete" for concrete slab installation.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical literature and test reports for vapor barrier material indicating compliance with specified requirements. Include installation instructions for placement, seaming of joints and sealing of penetrations.

B. Samples: Submit one foot (12-inches) square sample of vapor barrier material indicating thickness and composition.

1.4 QUALITY ASSURANCE:

A. Inspection: Obtain Architect's inspection and acceptance of installed vapor barrier before placing concrete.

1.5 PROJECT CONDITIONS:

A. Verify that subgrades are compacted, clean and free of debris prior to installation of vapor barrier.

B. Subgrades shall be smooth and without sharp projections which could puncture membrane material.

PART 2 - PRODUCTS

2.1 VAPOR BARRIER:

A. Acceptable Products; subject to compliance with specified requirements:
   1. W. R. Meadows, Inc.; Perminator 15 Mil Underslab Vapor-Mat.
   2. Reef Industries, Inc.; Griffolyn 15 Mil Green.

3. Stego Industries, LLC; Stego Wrap 15-Mil Class A.

B. Characteristics: Multi-ply, laminated, high density polyolefin or polyethylene membrane meeting ASTM E1745, Class A and having a perm rating less than 0.02 when tested in accord with ASTM E-96, Procedure A.; minimum 15 mils thickness.

C. Accessories:

1. Seam Tape: Type as recommended by vapor barrier manufacturer.
2. Vapor Proofing Mastic: Type as recommended by vapor barrier manufacturer.
3. Pipe Boots or Collars: Construct pipe boots or collars from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that subgrades are compacted, level, and acceptable for installation of vapor barrier membrane.

B. Correct deficiencies before beginning installation of vapor barrier membrane.

3.2 INSTALLATION:

A. Comply with ASTM E1643 for installation of vapor barriers.

B. Install vapor barrier over compacted granular fill of interior building areas to receive concrete slabs and other locations as indicated.

C. Lay membrane with seams perpendicular to and lapped in direction of pour. Lap and seal edges of membrane, including openings and penetrations.

D. Vapor barrier shall be continuous under slab extending up vertical surfaces within 1/2-inch from top of slab and under joint filler material.

E. Seal penetrations in accord with manufacturer's instructions.

1. Install manufacturer's pipe boots or collars to seal pipes.
2. Seal around pipe banks with mastic as recommended by vapor barrier membrane manufacturer.

F. Repair damages in vapor barrier membrane by cutting patches of same material to overlap damaged areas at least 6-inches and taping all sides for a tight seal.

END OF SECTION 072650

SECTION 072726

FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes: Fluid-applied, vapor-permeable membrane air barriers.

B. Related Sections:
1. Division 3 Section - "Cast-In-Place Concrete."
2. Division 4 Section - "Unit Masonry."
3. Division 5 Section - "Cold-Formed Metal Framing."
4. Division 7 Section - "Thermal Insulation."

1.3 DEFINITIONS:

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PERFORMANCE REQUIREMENTS:

A. Air-Barrier Performance: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 283, ASTM E 783 or ASTM E 2357.

1.5 SUBMITTALS:

A. Product Data: For each type of product. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

C. Qualification Data: Submit for qualified installer to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. Submit for Architect's information only.

D. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier. Submit for Architect's information only.

E. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency. Submit for Architect's information only.

1.6 QUALITY ASSURANCE:

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer, with not less than five (5) years' experience installing specified membrane air barrier materials similar to the extent indicated for the Project with a record of successful in-service performance.

B. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

C. Mockup: Apply fluid-applied air barrier membrane to gypsum sheathed metal stud backup support framing of masonry sample panel specified in Division 4 Section "Unit Masonry" to set quality standards for materials and execution.

1. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS:

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER:

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Elastomeric, Modified Bituminous Membrane:
      1) Henry Company; Air-Bloc 17MR.
      2) Hohmann & Barnard, Inc.; Textroflash Liquid VP.
      3) Meadows, W. R., Inc.; Air-Shield LMP.
      4) Tremco Incorporated, an RPM company; ExoAir 220R.
   b. Synthetic Polymer Membrane:
      1) Carlisle Coatings & Waterproofing Inc.; Barritech VP.
      2) Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
      3) Henry Company; Air-Bloc 31 or Air-Bloc 33.
      4) Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight VP.
      5) Tremco Incorporated, an RPM company; ExoAir 230.
2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.

2.2 ACCESSORY MATERIALS:

A. Provide Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil thick, cross-laminated polyethylene film with release liner backing.

D. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

E. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

F. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

G. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

H. Modified Bituminous Transition Strip: Vapor retarding, 40-mils thick, smooth surfaced, self-adhering; consisting of 36-mils of rubberized asphalt laminated to a 4-mil thick polyethylene film with release liner backing.

I. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50 to 65 mils thick, cured sheet neoprene with manufacturer's recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.

J. Preformed Silicone-Sealant Extrusion:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 123 Silicone Seal.
   b. Momentive Performance Materials Inc.; US11000 UltraSpan.
   c. Pecora Corporation; Sil-Span.
   d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.
2. Characteristics: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

K. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 07 9200 "Joint Sealants."

L. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.

3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

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

3.2 SURFACE PREPARATION:

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT:

A. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions.
1. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry.
2. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

B. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions.
1. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
2. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

3.4 TRANSITION STRIP INSTALLATION:

A. Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install compatible strip material on roofing membrane or base flashing so that a minimum of 3-inches of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day.

1. Reprime areas exposed for more than 24 hours.
2. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply strip so that a minimum of 3-inches of coverage is achieved over each substrate. Maintain 3-inches of full contact over firm bearing to perimeter frames with not less than 1-inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
2. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
3. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6-inches on center. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
4. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch wide, modified bituminous or counterflashing strip compatible with through-wall flashing.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6-inches (150 mm) beyond repaired areas in strip direction.

3.5 AIR-BARRIER MEMBRANE INSTALLATION:

A. Install fluid-applied air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Vapor-Permeable Membrane Air Barrier: Apply a continuous unbroken air-barrier membrane to substrates to achieve total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mils dry film thickness.

1. Apply air-barrier membrane material in one or more equal coats as directed by manufacturer's application instructions.
2. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

C. Apply strip and transition strip overlapping onto cured air-barrier material according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL:

A. Testing Agency: Owner will engage a qualified testing agency to perform inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.

5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Air barriers will be considered defective if they do not pass inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components.

3.7 CLEANING AND PROTECTION:

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 074114

STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes: Standing-seam metal roof panel system including roof insulation and related installation accessories.

B. Related Sections:
1. Division 5 Section – "Steel Decking."
2. Division 5 Section – "Cold-Formed Metal Framing."
3. Division 6 Section – "Rough Carpentry."
4. Division 7 Section – " Sheet Metal Flashing and Trim."

1.3 PERFORMANCE REQUIREMENTS:

A. System Performance: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. 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.

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 6.24 lbf/sq. ft.

D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class UL 90 rating.

E. 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.
1. Temperature Change (Range): 120-degrees F., ambient; 180-degrees F., material surfaces.
2. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

F. FM Approvals Listing: Provide roof insulation materials that comply with requirements in FM Approval Standard 4450 and FM Approval Standard 4470. Roof insulation material shall be listed in FM Approval Guide for classifications specified. Materials shall be identified with FM Approvals markings.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications for each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings: Show layout of metal roof panels, details of edge conditions, joints, panel profiles, supports, anchorages, trim and flashings.
1. Include roof plan showing layout of insulation boards and attachment methods to meet specified wind-uplift resistance requirements.
   a. Indicate fastener types, sizes, spacings and fastening patterns.
   b. Show roof edge eave and rake details.
2. Include fabrication and installation details for metal roofing.
3. Indicate attachment system, trim, flashings, closures, and accessories; and special details.
4. Indicate fastener types and spacings, expansion provisions and sealant locations.
5. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12-inches (1-ft.).
6. Indicate that the qualified Professional Engineer responsible for preparing structural analysis has reviewed shop drawings.

C. Structural Analysis: Include structural analysis data signed and sealed by the qualified Professional Engineer responsible for their preparation indicating compliance with specified structural performance requirements.

D. Samples:
1. Metal Panels: Submit 12-inch (1-ft.) length by actual panel width indicating profile, style, surface finish and color selected.
2. Metal Roof Accessories: Submit one sample each actual accessory material required. Include fasteners, closures, and other metal panel accessories.
3. Insulation Board: Submit 12-inch (1-ft.) square size sample of roof insulation board indicating foam material and nailable surface.
4. Fasteners: Submit three actual fasteners of type, size and length required for attachment of specified roof insulation board material.

E. Qualification Data: Submit documentation for Installer and Professional Engineer indicating compliance with specified qualification requirements. (Submit for Architect's information only.)

F. Product Test Reports: Submit for each product performed by a qualified testing agency demonstrating compliance with specified performance requirements. (Submit for Architect's information only.)

G. Field Quality-Control Reports: Submit inspection reports and results of field tests performed on installed system prepared by manufacturer's factory-authorized service representative. (Submit for Architect's information only.)

H. Sample Warranties: Submit sample copies of specified warranties. (Submit for Architect's information only.)

I. Maintenance Data: Submit metal panel manufacturer's cleaning and maintenance recommendations. Include with operation and maintenance manuals as part of project closeout documents.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer shall have minimum five (5) years' experience in the erection of metal roof panel systems similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated.

C. Mock-Ups: Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mock-ups for typical roof area only, including accessories.
      a. Size: Approximately 12-feet length by 6-feet width.
      b. Indicate the following:
         1) Underlayment application.
         2) Panel layout and attachment method to supporting substrate.
         3) Exposed seam and seam termination.
         4) Flashing trim and accessories.
   2. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect specifically approves such deviations in writing.
   3. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed.
   1. Package metal panels for protection during transportation and handling.
   2. Deliver insulation materials to site in manufacturer's original protective packaging with labels intact.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering.
   1. Store metal panels to ensure dryness, with positive slope for drainage of water.
   2. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
   1. Store in a dry location, away from direct exposure to sunlight. Stack insulation flat when storing.
   2. Weigh down stored materials to prevent from wind damage.

E. Retain strippable protective covering on metal panels during installation.

1.7 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8 COORDINATION:

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY:

A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Panel Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

C. Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within warranty period of Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS AND FINISHES:

A. Panel Material: Coil-coated aluminum sheet complying with ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
   1. Surface: Manufacturer's standard stucco-embossed finish.
   2. Thickness: 0.040-inch, minimum.
   3. Finish: Coil-coated finish as specified.

B. Flashing and Flat Stock Material: Same material, gauge and finish as specified for panels.

C. Coil-Coated Finishes:
   1. Exposed Finish for Exterior Panel Surfaces: Manufacturer's two-coat fluoropolymer finish complying with AAMA 2605 containing not less than 70 percent PVDF resin by weight in color coat.
      a. Coating Application: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      b. Color and Gloss: As selected by Architect from manufacturer's standard colors and gloss.
   2. Concealed Finish: 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; applied to pretreated metal surfaces.

2.2 STANDING-SEAM METAL ROOF PANEL SYSTEM:

A. Acceptable Products; subject to compliance with specified requirements:
   1. Atas International, Inc.; 2" Field-Lok.
   2. Centria; SRS System
   3. Fabral / Euramax Company; PowerSeam Standing Seam Roofing System.
   4. McElroy Metal, Inc.; 238T Standing Seam Roofing System.
   5. Merchant & Evans, Inc.; Zip-Rib.
   6. Petersen Aluminum Corporation; Tite-Loc Plus.
   7. Innovative Metals Co. Inc.; Series 300.
   8. Morin Inc. Corp.; SSR System.

B. Standing-Seam Roof Panels: Manufacturer's standard factory-formed, standing-seam roof panel assembly designed for concealed mechanical attachment of panels to roof deck.
   1. Seam Type: Manufacturer's standard bulb seam, double-folded seam or tee-seam with separate cap in matching material and finish; designed for field seaming by use of manufacturer's mechanical machine seamer.
   2. Seam Height: 2-inches minimum, 3-inches maximum.
   3. Panel Width: 16-inches (1'-4"), nominal.
   4. Panel Length: Provide in full continuous lengths without lap seams or joints.
   5. Anchor Clips: Manufacturer's standard, floating type panel clips designed to meet wind-uplift resistance rating and accommodate thermal movement; fabricated from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel.

2.3 UNDERLAYMENT MATERIALS:

A. Membrane Underlayment:
   1. Acceptable Products; subject to compliance with specified requirements:
      a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
      b. Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Metal-Fab Manufacturing, LLC; MetShield.
      e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
   2. Characteristics: Self-adhering, high-temperature composite sheet membrane consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
      a. Thickness: 30 to 40 mils, minimum.
      b. Thermal Stability: Stable after testing at 240-degrees F per ASTM D 1970.
      c. Low-Temperature Flexibility: Passes after testing at minus 20-degrees F. per ASTM D 1970.
   3. Accessory Products: Provide primer as recommended by underlayment manufacturer for substrate conditions encountered.

B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 ROOF INSULATION:

A. Acceptable Manufacturers; subject to compliance with specified requirements:
   1. Atlas Roofing Corp.
   2. Firestone Building Products Co.
   3. GAF Materials Corporation.
   4. Hunter Panels.
   5. Johns Manville Corp.
   6. Rmax, Inc.

B. Roof Insulation: Rigid polyisocyanurate insulation boards with non-asphaltic glass facing sheets; meeting ASTM C1289, Type II; FM Approved.
   1. Facer Type: Class 1 or 2; felt or glass-fiber mat on both major surfaces.
   2. Density and Compressive Strength: As required by roof panel manufacturer's recommendation and engineering analysis.
   3. Face Size: Sizes as required to meet specified wind-uplift resistance rating.
   4. Thickness: 3.6-inches, minimum.
   5. Long Term Thermal Resistance (LTTR) "R" value at 75 degrees F.: R-21.1 (21.1 deg F × h × sq. ft./Btu).
   6. Fire Hazard Classification: FM Class I.

C. Insulation Fasteners: Factory-coated, corrosion-resistant, steel fasteners with metal or plastic fastening plates, designed for fastening roof insulation to substrate and acceptable to roofing system manufacturer.
   1. Corrosion Resistance: Passing FM 4470 Corrosion Test, modified DIN 50018 standard, with a maximum of 15% red rust after 15 wet and dry acidic atmosphere cycles in Kesternich cabinet.

2. Size: As recommended by manufacturer for board thickness required and specified wind-uplift resistance rating.

2.5 MISCELLANEOUS MATERIALS:

A. Bearing Plates: Fabricated from rolled-formed, galvanized structural steel sheet conforming to ASTM A653, Coating Designation G90; gauges and sizes as required by manufacturer's structural analysis to secure insulation to roof deck and accept anchor clip attachment.

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 ridges, 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 thickness, 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, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts:
1. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required.
a. Fabricate in minimum 96-inch (8-ft.) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual."
b. Furnish gutter supports spaced a maximum of 36-inches (3-ft.) on center, fabricated from same metal as gutters.
c. Provide wire ball strainers of compatible metal at outlets.
d. Finish gutters to match metal roof panels.
2. Downspouts: Formed from same material as roof panels.
a. Fabricate in 10-foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual."
b. Finish downspouts to match gutters.

E. Panel Fasteners: Self-tapping stainless steel screws designed to withstand design loads.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
1. Sealant Tape: Pressure-sensitive, 100-percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic,

nonsag, nontoxic, nonstaining tape 1/2-inch wide and 1/8-inch thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187; compounded for 15-mil dry film thickness per coat, unless otherwise indicated.

2.6 FABRICATION:

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer. Provide in sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

E. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

F. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components

are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

B. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

C. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROOF INSULATION INSTALLATION:

A. Install roof insulation over roof decking in accordance with final reviewed shop drawings and manufacturer's product data.

B. Attach insulation to roof deck using specified mechanical fasteners and spaced as indicated to achieve wind-uplift resistance rating.

C. Lay insulation boards parallel with eaves with end joints staggered from subsequent boards at least 12-inches (1'-0"). Allow approximately 1/8-inch space between board edges and ends for expansion.

D. Install preservative treated wood nailers and blocking equal to insulation thickness along eaves, rakes and cut-outs and as required. Install nailers and blocking in accord with provisions specified in Division 6 section "Rough Carpentry."

3.3 MEMBRANE UNDERLAYMENT INSTALLATION:

A. Install specified membrane underlayment over entire installed roof insulation surface area in accordance with manufacturer's product data.

B. Prime surfaces as required by underlayment manufacturer’s recommendation for substrate conditions. Apply materials only to clean, dry and sound surfaces as directed by manufacturer’s instructions.

C. Install underlayment beginning at lower edge or eave of deck assembly and working up; removing backing release paper and adhering membrane firm to substrate.
   1. Apply membrane, wrinkle free, in shingle fashion to shed water.
      a. Lap each course over lower course with 4-inches minimum side laps and 6-inches minimum end laps. Roll laps with roller.

b. Stagger end laps at least 24-inches (2-ft.) away from laps in adjacent courses.

2. Install full width underlayment sheet centered along valleys and ridges; extending equal distance each side with membrane pressed firm in place.
   a. Apply membrane to valleys before application of underlayment at eaves and subsequent courses.
   b. Where roofing meets walls and similar vertical surfaces, extend underlayment up vertical surfaces, minimum 6-inches.

D. Do not allow installed underlayment to be exposed to the weather for prolong periods; cover with specified metal roof panels as soon as possible, within fourteen (14) days following membrane application.

3.4 METAL PANEL INSTALLATION:

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work secured in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
1. Install panel anchor clips using bearing plates positioned over membrane underlayment and roof insulation.
2. Attach panel clips using fasteners of size and length required by manufacturer's design to extend through bearing plate, membrane underlayment and roof insulation, penetrating through roof deck to provide ample anchorage to meet specified wind uplift requirements.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
   1. Install clips to supports with self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
   2. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eaves with gutter hangers spaced not more than 36-inches on center using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1-inch away from walls; locate fasteners at top and bottom and at approximately 60-inches on center in between.
   1. Provide elbows at base of downspouts to direct water away from building.
   2. Connect downspouts to underground drainage system indicated.

J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES:

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4-inch in 20-feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL:

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports for submittal to Architect.

3.7 CLEANING AND PROTECTION:

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions.
   1. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer.
   2. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074114

SECTION 074294

METAL SOFFIT PANELS

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. Section Includes: Concealed-fastener, lap-seam metal soffit panels, including installation accessories.

B. Related Sections:

1. Division 5 Section - "Cold-Formed Metal Framing."
2. Division 6 Section - "Rough Carpentry,"
3. Division 7 Section - "Thermal Insulation."
4. Division 7 Section - "Fluid-Applied Membrane Air Barriers."
5. Division 7 Section - " Sheet Metal Flashing and Trim."
6. Division 7 Section - "Joint Sealants."

1.3 PERFORMANCE REQUIREMENTS:

A. Soffit Panel Performance: Metal soffit panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Structural Performance: Provide metal soffit panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592.

1. Wind Loads: Comply with positive and negative wind pressure loading requirements of the International Building Code, 2012 edition with State of Georgia amendments.
2. Deflection Limits: Metal soffit panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/240 of the span.
3. Capacity for gauge, span, or loading other than those tested may be determined by interpolating test results.
    a. Compute uplift loads on anchor screws with full recognition of prying forces from eccentric clip loading.
    b. Calculate holding strength of fasteners in accordance with the thickness or length of embedment and properties of the material holding the point.
    c. Use factors of safety as recommended by the industry for the material involved.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of soffit area when tested according to ASTM E 283 at test-pressure difference of 1.57 lbf/sq. ft.

D. Water Penetration: No water penetration when tested according to ASTM E 331 at minimum uniform static air pressure difference of 6.24 lbf/sq. ft. or 20 percent of the design wind pressure whichever is greater, but not more than 12 lbf/sq. ft.

E. 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.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications for each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal soffit panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

1. Distinguish between factory, shop and field-assembled work.
2. Include details of the following accessory items, at a scale of not less than 1-1/2 inches per 12-inches:
   a. Flashing and trim.
   b. Anchorage systems, including furring.
3. Indicate that the qualified Professional Engineer responsible for preparing design analysis has reviewed shop drawings.

C. Design Analysis: Include analysis signed and sealed by the qualified Professional Engineer responsible for their preparation indicating that metal soffit panel assemblies comply with specified performance requirements, including loading and deflection criteria.

D. Samples:

1. For Initial Selection: Submit manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for each type of metal soffit panel indicated with factory-applied finishes.
   a. Include similar samples of trim and accessories involving color selection.
   b. Include manufacturer's color charts for each type sealant exposed to view consisting of strips of cured sealants showing the full range of colors available.
2. For Verification: Submit for each type of exposed finish required, prepared on actual material samples of size indicated below.
   a. Metal Soffit Panels: 12-inches length by actual panel width. Include fasteners, closures, and other metal soffit panel accessories.

b. Trim and Closures: 12-inches length of each type required. Include fasteners and other exposed accessories.
c. Accessories: 12-inch length samples for each type of accessory.

E. Qualification Data: Submit for installer and for Professional Engineer to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. (Submit for Architect's information only)

F. Product Test Reports: Furnish copies of all certified laboratory test reports required by this Section and by the referenced publications. Conduct testing at an approved laboratory or under supervision of an independent engineer. (Submit for Architect's information only)

G. Field Quality-Control Reports: Submit reports prepared by testing and inspection agency indicating results of field testing. (Submit for Architect's information only)

H. Maintenance Data: For metal soffit panels to include in maintenance manuals. Submit as part of contract closeout documents.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced installer who has completed metal soffit panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance. Installer shall employ workers trained and approved by manufacturer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of exterior metal soffit panels that are similar in material, design, and extent to those indicated for this Project. Engineer's service shall include review of shop drawings.

C. Source Limitations: Obtain each type of metal soffit panel from a single manufacturer and a single source.

D. Mock-Ups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mock-up of typical soffit panel; approximately one bay wide by full length, including supports, attachments, and accessories.
2. Notify Architect seven (7) days in advance of the dates and times when mock-ups will be constructed and ready for Architect's review.
3. Acceptance of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect specifically approves such deviations in writing.
4. Maintain accepted mock-ups during construction in an undisturbed condition as a standard for judging the completed Work.
5. Accepted mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and handle metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels for period of metal panel installation.

1.7 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal soffit panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and dimensions of openings by field measurements before metal panel fabrication, and indicate measurements on shop drawings.

C. Coordination: Coordinate metal soffit panel assemblies with rain drainage work, flashing, trim, and erection of cold-formed metal framing and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY:

A. Installation Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Panel Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with requirements, provide panels by one of the following:
1. ATAS International, Inc
2. Metal Sales Manufacturing Corp.
3. Petersen Aluminum Corporation.

2.2 PANEL MATERIALS AND FINISHES:

A. Soffit Panel Material: Coil-coated aluminum sheet meeting ASTM B 209.
1. Alloy and Temper: Manufacturer's standard as recommended and required to suit forming operations and structural performance.
2. Thickness: 0.032-inch, minimum.

B. Flashing and Flat Stock Material: Same material, gauge and finish as specified for panels.

C. Coil-Coated Finishes:
1. Exposed Finish for Exterior Soffit Panel Surfaces: Manufacturer's two-coat fluoropolymer finish complying with AAMA 2605 containing not less than 70 percent PVDF resin by weight in color coat.
a. Coating Application: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
b. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 SOFFIT PANELS:

A. Basis of Design: Atas International, Inc.; OPF080 Panel.
1. Soffit panel systems of similar design, material and construction by other acceptable manufacturers may be submitted for Architect's acceptance.
2. Acceptance is subject to compliance with specified requirements as evidenced by submittal of manufacturer's product data, shop drawings and test reports.

B. Panel Design: Flush-profile, concealed fastener interlocking lap-seam panel system; unperforated and perforated.

C. Panel Characteristics: Factory-formed metal panels from specified coil-coated aluminum sheet material in profile and size indicated with vertical edges and flush interlocking joints. Panels shall be designed for field assembly with formed lapping and interconnecting side edges and mechanical attachment to supports using concealed fasteners providing sealed weathertight joints.
   1. Panel Profile: Flush face profile with edges formed to provide interlocking seams for concealed fastener installation.
   2. Panel Surface: Smooth, flat finish.
   3. Panel Size: 3/4-inch (0.75-inch) depth by 8-inch exposed face width.
   4. Panel Lengths: Provide in manufacturer's maximum full continuous lengths practicable.
   5. Perforated Panels: Provide perforated soffit panels for installation at locations indicated.
      a. Perforation Pattern: Manufacturer's standard full venting pattern.
      b. Ventilation: Not less than 15.5 sq. inch net free area per linear foot.

2.4 MISCELLANEOUS ACCESSORIES:

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
   1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
   2. Where exposed fasteners are required, provide fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating.
   3. Provide metal-backed EPDM, PVC, or neoprene sealing washers under heads of exposed fasteners located on weather side of panels.

B. Soffit Panel Accessories: Provide components required for a complete metal soffit panel assembly including trim, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal soffit panels, unless otherwise indicated.
   1. Closures: Provide closures fabricated of same metal as metal soffit panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal soffit panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Formed from specified material of not less than metal thickness of panel. Provide flashing and trim as required to seal against weather and to provide finished appearance.
   1. Locations include, but are not limited to corners, framed openings, terminations, and trim.
   2. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100-percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch wide and 1/8-inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal soffit panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 SECONDARY FRAMING:

A. Hat-Shaped, Rigid Furring Channels: Complying with ASTM C 645, fabricated from cold-formed metallic-coated steel sheet meeting ASTM A 653/A 653M, Coating Designation G90 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated. Provide for soffit panel installation as recommended by manufacturer.
1. Metal Thickness: 0.052–inch (18-gauge), minimum.
2. Size: 7/8-inch (0.875-inch) depth unless otherwise directed by manufacturer's design analysis.

B. Fasteners for Metal Framing: Corrosion resistant type of material, size, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.6 FABRICATION:

A. Fabricate and finish metal soffit panels, including accessories, at the factory to greatest extent possible, 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. Fabricate metal soffit panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Provide panel profile for full length of panel.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

3. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal panel manufacturer. Provide in sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application but not less than thickness of metal being secured.

E. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either materials or finishes.

F. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal soffit panel supports, and other conditions affecting performance of work.

B. Examine soffit framing to verify that studs, angles, channels, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal soffit panel manufacturer.

C. Examine roughing-in for components and systems penetrating metal soffit panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Coordinate metal panel installation with flashing; trim, roofing, and other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

C. Secondary Framing: Install furring and other secondary panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION:

A. Install metal soffit panels according to manufacturer's written instructions and final reviewed shop drawings. Install panels perpendicular to furring or subgirts unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal soffit panels.
3. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal panels are installed.
4. Install screw fasteners in predrilled holes.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal panel work proceeds.
7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
9. Align bottom of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
10. Provide weathertight escutcheons for pipe and conduit penetrating exterior soffits.

B. Lap-Seam Metal Soffit Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Install metal soffit panels in continuous lengths to full width of soffits.
2. Install panels perpendicular to support framing.
3. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
4. Provide metal-backed washers under heads of fasteners bearing on weather side of metal panels. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
5. 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.
6. Where exposed fasteners are required, locate and space in uniform vertical and horizontal alignment.
7. Provide sealant tape at lapped joints of metal panels and between panels and protruding equipment, vents, and accessories.
8. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps; on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weathertight.
9. At panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

10. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

C. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.

D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting each metal surface in area of contact with a bituminous coating or by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by metal panel manufacturer.

E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal soffit panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal soffit panel manufacturer.

1. Seal soffit panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.4 ACCESSORY INSTALLATION:

A. Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion.

1. Coordinate installation with flashings and other components.
2. Install components required for a complete metal soffit panel assembly including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 CLEANING AND PROTECTION:

A. After metal soffit panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions.
   1. On completion of metal soffit panel installation, clean finished surfaces as recommended by metal panel manufacturer.
   2. Maintain in a clean condition during construction.

C. Damaged Units: Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074294

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes:
1. Formed sheet metal flashing and trim work, including but not limited to the following:
a. Counter flashing system.
2. Miscellaneous sheet metal accessories as indicated and as required by project conditions.

B. Exposed formed sheet metal fabrications are to be prefinished as specified, in manufacturer's standard non-metallic colors selected by Architect.

C. Related work specified elsewhere includes:
1. Division 7 Section – "Manufactured Curbs."
2. Division 7 Section - "Joint Sealants."

1.3 DESIGN AND PERFORMANCE REQUIREMENTS:

A. Performance Requirements: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, 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. Design Requirements: Design, fabricate and install copings and roof edge flashings to comply with ANSI/SPRI ES-1 and requirements of governing building code , based on wind loading conditions for the Project.

C. Sheet Metal Standard for Flashing and Trim: Comply with NRCA "The NRCA Roofing Manual" and SMACNA "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

D. Thermal Movements: Allow for thermal movements from indicated ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.
1. Temperature Change: 120-deg F, ambient; 180-deg F, material surfaces.
2. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.4 SUBMITTALS:

A. Product Data: Submit for sheet metal materials and accessories. Include manufacturer's current technical product data, installation instructions and general recommendations for each specified sheet metal material, fabricated product, coating system, and color selection data.

B. Shop Drawings: Show layout, profiles, methods of joining, and anchorages details.

1. Provide layouts at 1/4-inch scale and details at 3-inch scale.
2. Show fabrication details and installation layouts, expansion-joint locations, and keyed details.
3. Indicate material, metal thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing sheet metal fabrications. Show layout and spacing of fasteners, cleats, clips, and other attachments.
6. Include details of connections to adjoining work.

C. Samples: Submit the following sheet metal flashing and accessory items:

1. Physical sheet metal color samples where selection is required.

D. Qualification Data: Submit fabricator and installer to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. (Submit for Architect's information only.)

1.5 QUALITY ASSURANCE:

A. Fabricator Qualifications: Fabricator's shop shall employ skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose fabrication work have a record of successful in-service performance with minimum Five (5) years' experience. Shop shall be listed as able to fabricate copings and roof edge flashings that are SPRI ES-1 tested and approved.

B. Installer Qualifications: Installer shall have not less than Five (5) years' experience in the completion of sheet metal flashing and trim installation work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

C. Regulatory Requirements: Comply with roof edge securement requirements of the International Building Code (IBC), 2012 edition, with State of Georgia amendments.

D. Mock-Up: Build mockups to demonstrate workmanship, aesthetic effects, and to set quality standards for fabrication and installation.

1. Construct mockup of typical coping and roof edge fascia flashing of approximate 10-feet length located on portion of building as directed by Architect. Mock-up shall include the following:
   a. Supporting construction, cleats, seams, attachments, and accessories.
   b. Typical mitered corner installation indicating seam construction and sealing method.
   c. Joint splice method with expansion provisions.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 PROJECT CONDITIONS:

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.8 WARRANTY:

A. Finish Warranty: Warrant fluoropolymer coating to remain free of checking, crazing, peeling, chalking or fading. Coating 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. Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: Twenty (20) years commencing on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS AND FINISHES:

A. Aluminum Sheet Material: Coil-coated aluminum sheet complying with ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and performance required.
1. Thickness: 0.040 inch, minimum, unless otherwise indicated.
2. Surface: Smooth, flat.
3. Finish: Coil-coated finish as specified.

B. Coil-Coated Finishes for Aluminum Sheet Material:

1. Exposed Finish: Two-coat fluoropolymer finish system complying with AAMA 2605, with a total dry film thickness of not less than 1.0-mils. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Coating Material: Fluoropolymer coating containing not less than 70-percent polyvinylidene fluoride (PVDF) resin by weight in color coat.

b. Color: As selected by Architect from manufacturer’s standard non-metallic colors.

2. Concealed Finish: Manufacturer's standard white or light-colored acrylic or polyester backer finish applied to pretreated metal surface. Coating system shall consist of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES:

A. Provide materials and types of fasteners, 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: Provide 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, unless otherwise indicated.

1. Blind fasteners or self-drilling screws shall be 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 Aluminum Sheet Metal: Aluminum or Series 300 stainless steel.

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 silicone 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. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion meeting ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

I. Membrane Subflashing: Minimum 40 mil thickness, non-reinforced, homogeneous vinyl sheet.

J. Felt: Asphalt-saturated organic felt meeting ASTM D226, Type II (No. 30), non-perforated.

K. Paper Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft., minimum.

L. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

M. Adhesives: Type recommended by flashing or underlayment manufacturers as applicable for waterproof and weather-resistant seaming and adhesive application of flashing and underlayment materials.

N. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

O. Concrete Splashblocks: Precast concrete units, minimum 4000-psi compressive strength; minimum 2-inches thickness by 12-inches (1'-0") width by 18-inches (1'-6") length, smooth formed.

2.3 FABRICATION:

A. Fabricate sheet metal flashing and trim to comply with details shown and recommendations in referenced 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. Fabricate flashing for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
4. Obtain field measurements for accurate fit before shop fabrication.
5. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
6. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
7. Provide matching materials and finish for fascia metal covering, flashing, counterflashing and trim.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4-inch in 20-feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of interlocking 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.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to referenced sheet metal standard.

E. Seams for Aluminum Sheet Metal:
   1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
   2. Pop-rivet joints for additional strength where required and at vertical faces.

F. Do not use graphite pencils to mark metal surfaces.

G. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer or fabricator.

H. Counter Flashing Systems: Fabricate in two-piece configuration with receiver, similar to SMACNA Figure. 4-4C, to allow removal of counter flashing for future re-roofing applications. Form receiver with legs to extend behind wall finish materials and for integration with air barrier flashing membrane.

I. Roof Penetration Hoods: Fabricate from specified aluminum sheet material according to SMACNA Figure 4-14A and as detailed on drawings. Notch side of hood to fit accurate around pipe penetration with not greater than 1/4-inch clearance.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrates are sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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

3.2 INSTALLATION REQUIREMENTS:

A. Install sheet metal flashing and trim to comply with specified performance requirements, manufacturer's installation instructions, and referenced sheet metal standards.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of welds and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work secured in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12-inches (1-ft.) on center.
6. Space individual cleats not more than 12-inches (1-ft.) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

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 referenced sheet metal standard.

1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. 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 interlocking 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.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant.

a. When ambient temperature at time of installation is between 40-deg F. and 70-deg F., set joint members for 50-percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

b. Do not install sealant-type joints at temperatures below 40-deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 7 Section - "Joint Sealants."

G. Field Seams: Install non-moving seams with flat-lock seams sealed with elastomeric sealant unless otherwise unless otherwise recommended by sealant manufacturer for intended use.

3.3 FORMED SHEET METAL INSTALLATION

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and referenced sheet metal standards.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.

2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Counterflashing: Coordinate installation of counterflashing with installation of roof base flashing. Insert counterflashing in receivers and fit tightly to base flashing. Extend counterflashing 4-inches over base flashing.

1. Lap counterflashing joints minimum of 4-inches.

2. Secure in waterproof manner by means of snap-in installation and seal with sealant.

C. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing according to roofing manufacturer's recommendations.

D. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Attach and seal flashing to equipment support member.

E. Roof Penetration Hoods: Install with flanges extending under roofing membrane and attached to wood nailers as directed by roofing system manufacturer’s product data. Attach top hood section to base portion with compatible corrosion-resistant screws and fitted neat around piping. Seal around pipe penetrating hood with compatible sealant.

3.4 ERECTION TOLERANCES:

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4-inch in 20-feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION:

A. Upon completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

B. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

1. After cleaning, repair and restore damaged metal and metal finishes with prefinished paint manufacturer's special air-drying touch-up paint, in manner such that touch-up is not apparent.
2. Replace damaged flashing and sheet metal work which cannot be repaired and when finish repair and restoration is not acceptable to Architect.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

D. Protection: Protect installed flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 079200

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Silicone weatherseal sealant.
2. One-part polyurethane sealant.
3. Silicone bath sealants.
4. Polyurethane sealant for horizontal traffic-bearing joints.
5. Acrylic-latex caulking compound.

B. Related Sections:
1. Division 4 Section – "Unit Masonry."
2. Division 8 Section – "Aluminum-Framed Entrances and Storefronts."
3. Division 9 Section – "Gypsum Board Assemblies."
4. Division 9 Section – "Acoustical Panel Ceilings."
5. Division 9 Section – "Painting."

1.2 DEFINITIONS

A. Sealant: A weatherproof elastomer used in filling and sealing joints, having properties of adhesion, cohesion, extensibility under tension, compressibility and recovery; designed to make joints air and watertight. Material is designed generally for application in exterior joints and for joints subject to movement.

B. Caulking Compound: A material used in filling joints and seams, having properties of adhesion and cohesion; not required to have extensibility and recovery properties, generally for application in interior joints.

C. Caulk: The process of filling joints, without regard to type of material.

D. Joint Failure: A caulked joint exhibiting one or more of the characteristics listed below.
1. Air and/or water leakage.
2. Migration.
3. Loss of adhesion.
4. Loss of cohesion.
5. Failure to cure.
6. Discoloration.
7. Staining of adjacent work.
8. Development of bubbles, air pockets or voids.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product literature, indicating conformance with specified requirements. Include installation instructions for each type sealant. Indicate preparation requirements for each substrate condition.

B. Color Samples: Submit samples for each type sealant specified. Samples shall be actual materials. Architect reserves the right to reject work not in conformance with selected colors, based upon samples submitted.

C. Adhesion Compatibility Tests: Submit letter from sealant manufacturer indicating that adhesion and compatibility testing have been performed on actual samples of aluminum storefront and curtain wall framing components.

1. Test results shall determine if materials are compatible and that adhesion is acceptable.
2. Indicate requirements for primers or special preparation for adhesion.
3. Testing will not be required if sealant manufacturer has conducted previous testing on current sealant products for adhesion and compatibility with specified framing components, joint substrates and other materials identical to those required for this Project and submits joint preparation data that are based on these tests indicating acceptable adhesion. Test results shall be current within the past two (2) years.

1.4 QUALITY ASSURANCE

A. Single Source Requirements: Each type joint sealant used throughout the Project shall be the product of a single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in manufacturer's original packaging.

B. Store materials in accordance with manufacturer's instructions complying with environmental conditions and recommended temperature ranges.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Install no materials under adverse weather conditions, or when temperatures are below or above those recommended by manufacturer's product data, or when substrate moisture content is above recommended levels.
2. Proceed with work only when forecasted weather conditions are favorable for joint cure and development of high early bond strength.
3. Wherever joint width is affected by ambient temperature variations, install materials only when temperatures are in lower third of manufacturer's recommended installation temperature range.
4. Do not install sealant materials when substrate temperature is below 40 degrees F.

B. Protection of Adjacent Surfaces:

1. Protect by applying masking material or manipulating application equipment to keep materials in joint. if masking materials are used, allow no tape to touch cleaned surfaces to receive sealant. Remove tape immediately after caulking, before surface skin begins to form.
2. Remove misapplied materials from surfaces using solvents and methods recommended by manufacturer.
3. Restore surfaces from which materials have been removed to original condition and appearance.

1.7 WARRANTY

A. Warrant work to be free from defects in materials and workmanship, including joint failure, for a period of Two (2) years, beginning at Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SILICONE WEATHERSEAL SEALANT:

A. Acceptable Products; subject to compliance with specified requirements:
1. Dow Corning Corp.; 790 Silicone Building Sealant.
2. Pecora Corp.; 890NST.
3. Tremco, Inc.; Spectrum I.

B. Characteristics:
1. Type: One part low modulus silicone rubber; meeting ASTM C 920, Type S, Grade NS, Class 100/50.
2. Joint Movement Capability: Plus 100% extension, minus 50% compression, minimum.
3. Colors: As selected by Architect from manufacturer's standard full range color selection.

2.2 ONE-PART POLYURETHANE SEALANT:

A. Acceptable Products; subject to compliance with specified requirements:
1. BASF Corporation; MasterSeal NP 1.
2. Pecora Corp., Dynatrol™ I-XL
3. Sika Corporation; Sikaflex-1a
4. Tremco, Inc., Dymonic 100.

B. Characteristics:
1. Type: One-part, non-sag, elastomeric polyurethane sealant meeting ASTM C920, Type S, Grade NS, Class 25; compatible for painting.
2. Color: As selected by the Architect from Manufacturer’s standard selection for compatibility with paint colors used.

2.3 POLYURETHANE SEALANT FOR HORIZONTAL TRAFFIC-BEARING JOINTS:

A. Acceptable Products; subject to compliance with specified requirements:
   1. BASF Corporation; MasterSeal SL 1 or SL 2
   2. Pecora Corporation; Urexpan NR-200 or DynaTrol II-SG.
   3. Sika Corporation; Sikaflex-2c SL.
   4. Sonneborn / BASF Construction Chemicals, LLC; Sonolastic SL-1 or SL-2.
   5. Tremco, Inc.; Vulkem 45SSL or THC-901.

B. Characteristics:
   1. Type: Single or multi-component, polyurethane sealant formulated for horizontal traffic bearing surfaces, meeting ASTM C920, Type S or M, Grade P or NS, Class 25; self-leveling for flat surfaces and non-sag for sloped surfaces.
   2. Color: As selected by the Architect from Manufacturer's standard selection.

2.4 SILICONE BATH SEALANT:

A. Acceptable Products; subject to compliance with specified requirements:
   1. BASF Corporation; MasterSeal 121.
   2. Dow Corning Corp.; 786 Mildew-Resistant Silicone Sealant.
   3. Momentive Performance Materials, Inc. (GE); SCS 1700 Sanitary Silicone Sealant.
   4. Pecora Corporation; 898NST Sanitary Mildew Resistant Silicone Sealant.

B. Characteristics:
   1. Type: One part silicone rubber; mildew and stain resistant meeting ASTM C 920, Type S, Grade NS; USDA or FDA approved.
   2. Color: White.

2.5 ACRYLIC-LATEX CAULKING COMPOUND:

A. Acceptable Products; subject to compliance with specified requirements:
   1. C.R. Laurence Company, Inc.; CRL 321.
   2. Momentive Performance Materials, Inc.; GE Max 2500 Caulk.
   3. Pecora Corp.; AC-20 +Silicone.
   4. Tremco, Inc.; Tremflex 834.

B. Characteristics: One-part, flexible, non-sag, non-staining, non-bleeding, paintable, siliconized acrylic-latex emulsion compound meeting ASTM C 834.

2.6 ACCESSORY MATERIALS:

A. Joint Cleaner: Type recommended by material manufacturer for substrates indicated.

B. Joint Primer/Sealer: Type recommended by material manufacturer for conditions, exposures and substrates indicated.

C. Bond Breaker Tape: Plastic tape applied to contact surfaces where bond to substrate or joint filler must be avoided for material performance.

D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam or neoprene foam as recommended by material manufacturer for compatibility with sealant. Provide size and shape or rod to control joint depth, break bond at bottom of joint, form optimum shape of bead on back side and minimize possibility of extrusion when joint is compressed.

E. Tooling Agent: Agent recommended by the material manufacturer to insure contact of material with inner joint faces.

F. Divider Strips: Synthetic rubber or closed cell synthetic foam not less than 1/16-inch thickness and full depth of sealant or caulking compound; approved by manufacturers of dissimilar materials as being compatible with each other.

PART 3 EXECUTION

3.1 JOINT SURFACE PREPARATION:

A. Clean joint surfaces immediately before caulking joints. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond.

B. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless material manufacturer's product data indicates alkalinity does not interfere with bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution; rinse with clean water and allow to dry before caulking.

3.2 APPLICATION

A. Comply with sealant and caulking materials manufacturer's product data, except where more stringent requirements are specified.

B. Prime or seal joint surfaces where recommended by material manufacturer. Do not allow primer/sealer to spill or migrate onto adjacent surfaces.

C. Install backer rod for all sealant and caulking materials, except where recommended to be omitted by the material manufacturer for application indicated. Place backer rod to maintain recommended sealant thickness and profiles. Substitute bond breaker tape for shallow, closed joints.

D. Employ installation techniques which will ensure that materials are deposited in uniform, continuous ribbons without gaps or air pockets, with complete wetting of joint bond surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form slight cove, so that joint will not trap moisture and debris.

E. Do not allow materials to overflow or spill onto adjacent surfaces. Use masking tape or other methods to prevent staining of adjacent surfaces.

F. Remove excess and misplaced materials as work progresses. Clean adjoining surfaces to eliminate evidence of misplaced materials, without damage to adjacent surfaces or finishes.

G. Tool joints of non-sag sealants to concave profile with smooth uniform surface, flush with edges of substrate. Maintain sealant depth-to-width ratio in accordance with manufacturer's product data.

H. Cure sealants and caulking compounds in accordance with manufacturer's product data to obtain high early bond strength, internal cohesive strength and surface durability. Protect uncured surfaces from contamination and physical damage.

3.3 SEALANTS AND CAULKING SCHEDULE

A. Exterior Joints:

1. Exterior brick masonry expansion and control joints, including joints abutting other adjacent materials: Silicone Weatherseal Sealant.
2. Exterior cast stone masonry joints, including expansion and control joints: Silicone Weatherseal Sealant.
3. Exterior joints around perimeter of aluminum curtain wall framing: Silicone Weatherseal Sealant.
4. Exterior joints around perimeter of aluminum storefront framing: Silicone Weatherseal Sealant.
5. Exterior joints at perimeter of hollow metal framing: Silicone Weatherseal Sealant.
6. Exterior joints at perimeter of metal soffit panels: Silicone Weatherseal Sealant.
7. Exterior joints in fiber-cement panels: One-Part Polyurethane Sealant.
8. Exterior joints around molded polyurethane millwork: One-Part Polyurethane Sealant.
9. Bedding joints for thresholds: Silicone Weatherseal Sealant.
10. Exterior horizontal traffic-bearing joints, including concrete walks and slabs: Polyurethane Sealant for Horizontal Traffic-Bearing Joints.

B. Interior Joints:

1. Interior masonry control joints: One-Part Polyurethane Sealant.
2. Interior horizontal (traffic-bearing) joints in concrete floor slabs; including control joints: Polyurethane Sealant for Horizontal Traffic-Bearing Joints.
3. Typical interior joints and seams at abutting and adjacent materials: Acrylic-Latex Caulking Compound.
4. Interior joints in conjunction with vanities, plumbing fixtures and toilet room finishes: Silicone Bath Sealant.

END OF SECTION 079200

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

SCHEDULE 0 - SUMMARY

PRODUCT DATA SHEET 0 - Section Includes: Work under this section comprises of furnishing hollow metal doors and frames, including transom frames, sidelight and window frames with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled.

1.1 Flush Steel Doors.
1.2 Steel frames.
1.3 Hollow Metal Framing Systems.

PRODUCT DATA SHEET 1 - Related Sections: Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section. The latest published edition of each reference applies.

1.1 Section 06 10 00 - Rough Carpentry
1.2 Section 08 11 19 – Stainless Steel Doors and Frames
1.3 Section 08 14 00 - Wood Doors
1.4 Section 08 34 00 – Special Function Doors
1.5 Section 08 71 00 - Door Hardware
1.6 Section 08 80 00 - Glazing
1.7 Section 09 90 00 - Painting and Coating
1.8 Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
1.9 Section 28 10 00 – Access Control

PRODUCT DATA SHEET 2 - References: The intent of this document is that all hollow metal and its application will comply or exceed the standards identified below. The latest published edition of each reference applies.

1.1 ANSI - American National Standards Institute - ansi.org
1.2 NFPA - National Fire Protection Association

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives
B. NFPA 101 – Life Safety Code
C. NFPA 105 – Standard Smoke Door Assemblies and Other Opening Protectives
D. NFPA 252 - Standard Method of Fire Tests of Door Assemblies.

1.3 DHI - Door and Hardware Institute – Door Security + Safety Professionals

A. Installation Guide for Doors and Hardware.
B. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
C. Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.

1.4 SDI - Steel Door Institute

A. SDI-105 – Recommended Erection Instructions for Steel Frames

B. SDI-107 – Hardware on Steel Doors (Reinforcement - Application)
C. SDI-111 - Recommended Details for Standard Steel Doors, Frames, Accessories, and Related Components
D. SDI-117 - Manufacturing Tolerances Standard Steel Doors and Frames
E. SDI-118 – Basic Fire Door Requirements
F. SDI A250.3 *Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames*
G. SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, and Frame Anchors
H. SDI A250.6 - *Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames*
I. SDI A250.8 - SDI-100 Specifications for Standard Steel Doors and Frames
J. SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
K. SDI A250.11 - Recommended Erection Instructions for Steel Frames
L. SDI A250.13 Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies

1.5 BHMA - Builders Hardware Manufacturers Association

A. BHMA A156.115 - Hardware Preparations in Standard Steel Doors and Frames.
B. BHMA A156.7 - Hinge Template Dimensions.

1.6 ASTM - American Society for Testing Materials

A. ASTM A568/A568M-19a Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements
B. ASTM A879/A879M-12(2017) Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
C. ASTM A653/A653M-19a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
D. ASTM A924/A924M-19 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
E. ASTM A1008/A1008M-18 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

1.7 ICC - International Code Counsel

A. ICC A117.1 – Accessible and Usable Building and Facilities.
B. ICC 500 Standard for the Design and Construction of Storm Shelters

1.8 UL - Building Materials Directory; Underwriters Laboratories Inc.

A. UL 10B - Standard for Neutral Pressure Fire Tests of Door Assemblies
B. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies
C. UL 1784 – Air Leakage Test of Door Assemblies
D. UL 752 – Standard for Bullet-Resisting Equipment

1.9 NAAMM/HMMA – National Association of Architectural Metal

Manufacturers/Hollow Metal Manufacturers Association

A. NAAMM/HMMA 840 – Guide Specification for Receipt, Storage, and Installation of Hollow Metal Doors and Frames.

1.10 WH - Certification Listings; Warnock Hersey International Inc.
1.11 Federal Emergency Management Agency (FEMA) 361 Guidelines, ICC500 - 2014

SCHEDULE 1 - SUBSTITUTIONS:

PRODUCT DATA SHEET 0 - All substitution requests must be submitted within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and their consultant

SCHEDULE 2 - SUBMITTALS

PRODUCT DATA SHEET 0 - Submittals to comply with provisions of Division 01, Submittal Procedures.
PRODUCT DATA SHEET 1 - Product Data: Manufacturer's standard details and catalog data indicating compliance with referenced standards and manufacturer's installation instructions.
PRODUCT DATA SHEET 2 - Shop Drawings: Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Shop drawings should include the following information to ensure doors and frames are properly prepared and coordinated to receive hardware.

1.1 Elevations of each door and frame type.
1.2 Details for door core.
1.3 Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
1.4 Locations of cutouts for glass and louvers.
1.5 Frame details for each frame type, including dimensioned profiles and metal thicknesses.
1.6 Mounting locations for hardware.
1.7 Thickness of reinforcement/preparations for hardware.
1.8 Details of anchorages, joints, field splices, and connections.
1.9 Details of accessories.
1.10 Details of moldings, removable stops, and glazing.
1.11 Fire ratings.
1.12 Finish.

PRODUCT DATA SHEET 3 - LEED Submittals: Provide documentation of how the requirements will be met:

1.1 Program Based on the U.S. Green Building Council LEED Reference Guide for Green Building Design and Construction Publication for the design, construction and major renovations of commercial and institutional buildings including core and shell and K-12 school projects.
1.2 Credits MR 4.1 and MR 4.2: Use materials with recycled content such that the sum of the post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 20% total based on cost of the total values of the material in the project.

A. Credits:
1. MR 4.1: 1 point -recycled content is at least 10% of the total value of the materials in the entire project.

2. MR 4.2: 1 additional point added to the MR 4.1 point – recycle content is at least 10% (MR 4.1 percentage plus an additional amount to equal a minimum of 20%) of the total value of the materials in the entire project.

1.3 Credits 5.1 and 5.2: Used building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

A. Credits:
1. MR 5.1: 1 point – At least 10% of the materials are extracted, processed and manufactured regionally.
2. MR 5.2: 1 additional point added to the MR 5.1 point – At least 20% (MR 5.1 percentage plus an additional amount to equal a minimum of 20%) of materials are extracted, processed and manufactured regionally.

PRODUCT DATA SHEET 4 - Samples: 12 by 12 inches (304 mm by 304 mm) cut away sample door with provisions for lockset, hinge and corner section of frame welded and prepped for specified hardware. Sample should be furnished with submittals for Owner approval. After approval return sample to door/frame supplier as confirmation of approved construction.

PRODUCT DATA SHEET 5 - Closeout Submittals to comply with Division 1, Closeout Submittals procedures.

PRODUCT DATA SHEET 6 - Furnish copies of manufacturer’s warranty information and maintenance instructions.

SCHEDULE 3 - QUALITY ASSURANCE

PRODUCT DATA SHEET 0 - Hollow Metal Distributor is to be a direct account of the manufacturer of the products furnished. In addition, that distributor must have in their regular employment an Architectural Hardware Consultant (AHC), Certified Door Consultant (CDC), an Architectural Openings Consultant (AOC), a Door & Hardware Consultant (DHC) or equivalent door and hardware industry experience who will be available to consult with the Architect and Contractor regarding any matters affecting the door and frame opening.

PRODUCT DATA SHEET 1 - Manufacturer Qualifications: Certified Member of the Steel Door Institute in good standing.

PRODUCT DATA SHEET 2 - Installer: Minimum five years documented experience installing products specified this Section.

PRODUCT DATA SHEET 3 - Certificates:

1.1 Manufacturer's certification that products comply with referenced standards.
1.2 Hollow Metal Manufacturer must provide documentation that they are an SDI Certified Manufacturer.

PRODUCT DATA SHEET 4 - Fire Rated Doors and Frames: Underwriters' Laboratories, Intertek Testing Services/Warnock Hersey, and Factory Mutual labeled fire doors and frames:

1.1 Provide labeled fire doors and frames in accordance with Underwriters Laboratories standard UL10C Positive Pressure Fire Tests of Door Assemblies.
1.2 Construct and install doors and frames to comply with current issue of NFPA 80.
1.3 Manufacture Underwriters' Laboratories labeled doors and frames in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
1.4 Manufacture Intertek Testing Services /Warnock Hersey labeled doors and frames in

strict compliance to ITS/WH procedures and provide the degree of fire protection capability indicated by the opening class.

1.5 Manufacture Factory Mutual labeled doors and frames in strict compliance to FM procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.

1.6 Affix a physical label or approved marking to each fire door and/or fire door frame, at an authorized facility as evidence of compliance with procedures of the labeling agency.

1.7 Conform to applicable codes for fire ratings. It is the intent of this specification that doors, frames, hardware and their application comply or exceed the standards for labeled openings. In case of conflict between types required for fire protection, furnish type required by NFPA and UL.

1.8 Provide Temperature Rise Fire Door Assemblies in exit enclosures and exit passageway with maximum transmitted temperature end point rating of not more than 250 degrees F (121 degrees C) above ambient at the end of 30 minutes of the standard fire test exposure.

1.9 For openings required to be fire rated exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

PRODUCT DATA SHEET 5 - Hurricane Doors: Provide door systems complying with -

1.1 Miami-Dade County Product Control Approval System - Miami-Dade County test protocols PA 201, PA 202, PA 203

1.2 Florida Building Code (FBC) Approval System requirements of and Florida Building Code test protocols TAS 201, TAS 202 and TAS 203.

1.3 Texas Department of Insurance (TDI) protocols TAS 201, TAS 202 and TAS 203. Impact Resistance:

A. The door assemblies are to satisfy TDI's criteria for protection from windborne debris in the Seaward, Inland I and Inland II zones.

B. Assemblies must pass an impact criterion of equivalent to Missile Level D specified in ASTM E 1996.

C. Assemblies to be installed at any height on the structure that does not exceed the assembly's design pressure rating.

D. Assemblies do not require protection with an impact protective system when installed in areas that require windborne debris protection.

1.4 Provide test report data validating compliance.

PRODUCT DATA SHEET 6 - Tornado Doors: Design Door and Frame Systems for Federal Emergency Management Agency (FEMA) community shelters and other areas of refuge to resist the design wind pressures and missile impact loads as detailed in Design and Construction Guidance for Community Safe Rooms - FEMA 361. Door and Frame Systems shall also be listed in compliance with ANSI / ICC 500 - Standard for the Design and Construction of Storm Shelters.

PRODUCT DATA SHEET 7 - Bullet Resistant Doors are to be manufactured and tested in accordance with UL752.

SCHEDULE 4 - DELIVERY, STORAGE, AND HANDLING

PRODUCT DATA SHEET 0 - Packing and Shipping

1.1 The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided to prevent rust or damage.
1.2 Provide cardboard wrapped or crated product to provide protection during transit and job site storage
1.3 Should wrappers become wet, remove immediately

PRODUCT DATA SHEET 1 - Delivery and Site Acceptance

1.1 The supplier shall deliver all materials to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Supplier shall coordinate delivery times and schedules with the contractor.
1.2 Deliver doors cardboard wrapped or crated to provide protection during transit and job site storage. Provide additional protection to prevent damage to any factory-finished doors. Mark all doors and frames with architects opening numbers as shown on the contract documents and shop drawings on the center hinge preparation location.
1.3 Upon delivery, check in doors and frames jointly with supplier. Inspect doors and frames upon delivery for damage, correct quantities or shortages. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the architect. Otherwise, remove and replace damaged goods as directed. Note shortages and replace immediately.

PRODUCT DATA SHEET 2 - Storage and Protection

1.1 Handle, store and protect products in accordance with the manufacturers printed instructions, ANSI/SDI A250.8 – Specifications for Standard Steel Doors and Frames, A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames, or ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames and NAAMM/HMMA 840 – Guide Specification for Receipt, Storage, and Installation of Hollow Metal Doors and Frames.
1.2 Store all materials in a dry area. All hollow metal material shall be stored so that it does not come in contact with water or moisture. Protect units from adverse weather elements.
1.3 Place units on 4 inch (102 mm) high wood sills to prevent rust and damage.
1.4 Store doors vertically under a properly vented cover, five units maximum in a stack with a ¼” space between doors to permit air circulation.
1.5 Store frames in an upright position with heads uppermost under cover.
1.6 Store assembled frames five units maximum in a stack with 2-inch (51 mm) space between frames to permit air circulation.

SCHEDULE 5 - COORDINATION

PRODUCT DATA SHEET 0 - Coordinate Work with other directly affected sections involving manufacture or fabrication of internal cutouts and reinforcement for door hardware, electric devices and recessed items.
PRODUCT DATA SHEET 1 - Coordinate Work with frame opening construction, door and hardware installation.
PRODUCT DATA SHEET 2 - Sequence installation to accommodate required door hardware.
PRODUCT DATA SHEET 3 - Verify field dimensions for factory assembled frames prior to fabrication.

SCHEDULE 6 - WARRANTY

PRODUCT DATA SHEET 0 - Comply with Division 01 Closeout Submittals
PRODUCT DATA SHEET 1 - All doors and frames shall be warranted in writing by the manufacturer against defects in materials and workmanship for a period of one (1) year commencing on the date of manufacture.

PART 2 - PRODUCTS

SCHEDULE 0 - MANUFACTURERS

PRODUCT DATA SHEET 0 - Basis of Design - MESKER a dormakaba Brand, Web: http://meskerdoor.com

2.1 Acceptable Manufacturer - Curries an ASSA Abloy Company

SCHEDULE 1 - General:

PRODUCT DATA SHEET 0 - Physical performance: Units shall comply with the 1 million cycles swing test requirement per ANSI A250.4 - Level A.
PRODUCT DATA SHEET 1 - Finishing:

1. Prime Gray to meet SDI A250.10

PRODUCT DATA SHEET 2 - Electrical Requirements: Coordinate all electrical requirements for doors and frames. Make provisions for installation of electrical items so that wiring can be readily removed and replaced.

1. Provide cutouts and reinforcements required for metal doors and frames to accept electric components.
2. Frame with Electrical Hinges: Junction box welded over center hinge reinforcing. Top or bottom hinge locations are not permitted.
3. Coordinate with Section 08 71 00 (or Division 28) for electrified hardware items.

SCHEDULE 2 - DOORS

PRODUCT DATA SHEET 0 - General: Construct exterior/interior doors to the following designs and gauges:

2.1 Exterior Doors: Zinc-Iron Alloy-Coated galvannealed steel A60 or Zinc-Coated Galvanized steel:

A. Thickness:
1. 16 gauge

B. Provide flush top/closed top channel for exterior swing-out doors to eliminate moisture penetration. Galvannealed steel top caps are permitted.

2.2 Interior Doors: Cold-rolled steel, ASTM A 1008/A 1008M:

A. Thickness:
1. 18 gauge

2.3 Door Thickness: 1-3/4 inches
2.4 Vertical edge seams: Provide doors with continuous vertical mechanical inter-locking joints at lock and hinge edges. Finish edges as follows:

A. Filled Vertical Edges (S): Continuous vertical mechanical interlocking joints with tack welds every 8 inches. Putty or filler applied to the edge seam and ground smooth.

2.5 Bevel hinge and lock door edges 1/8 inch (3 mm) in 2 inches (50 mm). Square edges on hinge and/or lock stiles are acceptable.

2.6 Reinforce top and bottom of doors with galvannealed 16 gauge minimum, welded to both panels.

2.7 Fire Rating: Supply door units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

2.8 Core Adhesion System – Basis of design - Moisture Cure Polyurethane Hot Melt:

A. Adhesives are to cure completely, meaning once set, they cannot be re-melted and will not soften or freeze and lose adhesion.
B. Adhesive system will have an enhanced resistance to flame spread in its cured state designed to pass UL 10C, Positive Pressure Fire Tests of Door Assemblies.
C. Bonded assemblies will withstand prolonged exposure from -35°F(-37°C) to 200°F (93°C) temperatures without exhibiting any signs of bond failure.
D. Cured adhesive film will remain flexible to allow for differences in thermal expansion and contraction of various substrates without sacrificing bond performance.

2.9 Core Material

A. Treadcore Polystyrene (Standard)

2.10 Glass moldings and stops:

A. Fabricate from 18 gauge minimum steel:
B. Install trim into the door as a four-sided welded assembly with mitered, reinforced and welded corners.
C. Trim: identical on both sides of the door.
D. Labeled and non-labeled doors: use the same trim to match esthetics.
E. Channeling requirements:
1. Cutouts larger than 36” in height require 18 gauge perimeter channelings in the cutout of the door prior to installation of the lite kit our louver.

2.11 Hardware Reinforcements:

A. Doors shall be mortised and adequately reinforced per the manufacturers guidelines for all hardware. Required mortise hardware reinforcements shall be drilled and tapped at the factory. Surface applied hardware shall be field drilled by hardware installer.
B. Hinge reinforcements for full mortise hinges: minimum 7 gauge with an extra long, high frequency top hinge reinforcement as a standard feature.
C. Lock reinforcements: minimum 16 gauge.
D. Closer reinforcements: minimum 14 gauge steel.
E. Projection welded hinge and lock reinforcements to the edge of the door.
F. Provided adequate reinforcements for other hardware as required.

PRODUCT DATA SHEET 1 - Full Flush Doors:

2.1 Basis of Design: Mesker N Series.

SCHEDULE 3 - DOOR FRAMES

PRODUCT DATA SHEET 0 - General: Construct exterior/interior metal door frames to the following designs and gauges;

2.1 Exterior Frames: Zinc-Iron Alloy-Coated galvannealed steel A60 or Zinc-Coated Galvanized steel:

A. Thickness:
1. 14 gauge.

2.2 Interior Frames construction: cold rolled steel, ASTM A 1008/A 1008M.

A. Thickness:
1. 16 gauge.

PRODUCT DATA SHEET 1 - Flush Steel Frames:

2.1 Basis of Design: Mesker F-Series.

2.2 Profile:

A. Face:
1. 2 Inches face dimension and types and throat dimensions indicated on the Door Schedule.

B. Stops:
1. Standard 5/8-inch-high stops

2.3 Provide reinforcements and accessories for specified hardware per SDI 250.6.

2.4 Anchors: Locate adjustable anchors in each jamb 6 inches from the top of the door opening to hold frame in rigid alignment.

A. Exposed fastener type; recessed hole at base of jamb for countersunk fastener installation.
B. Snap in base anchors
C. Strap anchors welded to frame

2.5 Fire Rating: Supply frame units bearing Labels for fire ratings indicated in Door Schedule for the locations indicated.

SCHEDULE 4 - HOLLOW METAL FRAMING SYSTEMS

PRODUCT DATA SHEET 0 - Hollow Metal Framing Systems:

2.1 Basis of Design: Mesker S-Series, M-Series.

2.2 Components: Construct architectural stick frame assemblies of standard frame components, fabricated as specified.

A. Exterior Frame Material: Zinc-Iron Alloy-Coated galvannealed steel A60 or Zinc-Coated Galvanized steel.
B. Interior Frames construction: 16 gauge cold rolled steel, ASTM A 1008/A 1008M steel.

C. Include galvannealed components and internal reinforcements with galvannealed frames.

2.3 Frame component requirements:

A. Prepare required sticks at door openings and frame assemblies for hardware as specified in Section 087100.
B. Fabricate frame assemblies from three basic components:
1. Open Sections (perimeter members) identical in configuration to standard frames.
2. Closed sections (intermediate members) with identical jamb depth, face dimensions, and stops as open sections.
3. Sill sections: To be flush with both faces of adjacent vertical members. Cut individual components to length and notched to assure square joints and corners.
C. Externally welded face joints at meeting mullions or between mullions and other frame members on the face surfaces only. Grind and finish face joints smooth.
D. Fabricate frame assemblies for shipment to the jobsite completely welded.
1. Field joints permissible only when the size of the total assembly exceeds shipping limitations.
2. Fabricate oversized frames in sections designated for splicing in the field.
E. Pierced and dimpled glazing beads for use with manufacturers' standard fasteners.
F. Provide necessary anchors for jambs, heads, and sills of assemblies.
G. Verify field dimensions as required. Do not begin fabrication until these dimensions have been verified and approved.

2.4 Accessories:

A. Glazing Bead: Formed steel sheet; screw-attached.
B. Steel Panels:
1. 1/2-inch – 1 inch thick and manufactured from 18 gauge or 16 gauge thick non-galvannealed or galvannealed steel faces with a polystyrene core.
2. 1-3/4 inches thick and manufactured from 18 gauge or 16 gauge thick non-galvannealed or galvannealed steel faces with a steel stiffened core for fire rated openings.

2.5 Fire Rating: Provide factory assembled welded units bearing Labels for fire ratings indicated on the Drawings.

SCHEDULE 5 - ACCESSORIES

PRODUCT DATA SHEET 0 - Anchors: Manufacturer's standard framing anchors, specified in manufacturer's printed installation instructions for project conditions.
PRODUCT DATA SHEET 1 - Astragals for pairs of doors: Manufacturer's standard for labeled and non-labeled openings.
PRODUCT DATA SHEET 2 - Plaster Guards: Same material as door frame, minimum 24 gauge (0.5 mm) minimum; provide for all strike boxes. Plaster guards not mandatory on interior after set frames.

PRODUCT DATA SHEET 3 - Silencers: Resilient rubber, Inserted type, three per strike jamb for single openings. Stick-on silencers shall not be permitted except on hollow metal framing systems.
PRODUCT DATA SHEET 4 - Glazing: Specified in Section 088000.

SCHEDULE 6 - FABRICATION

PRODUCT DATA SHEET 0 - Steel Frames:

2.1 Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

A. Clearances shall comply with the requirements of NFPA 80.

2.2 Factory-welded frames: Head and jamb intersecting corners mitered at 45 degrees, with back welded joints ground smooth.

A. Externally weld, grind, prime paint, and finish smooth face joints at meeting mullions or between mullions and other frame members per a current copy of ANSI/SDI A250.8.

2.3 Provide temporary steel spreaders (welded to the jambs at each rabbet of door openings) on welded frames during shipment. Remove temporary steel spreaders prior to installation of the frame.

PRODUCT DATA SHEET 1 - Tolerances shall comply with SDI-117 "Manufacturing Tolerances for Standard Steel Doors and Frames."
PRODUCT DATA SHEET 2 - Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel sheet.
PRODUCT DATA SHEET 3 - Unless otherwise indicated, provide exposed fasteners with countersunk flat or oval heads for exposed screws and bolts.
PRODUCT DATA SHEET 4 - Prepare doors and frames to receive mortised and concealed hardware per final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI-107 and ANSI-A115 Series specifications for door and frame preparation for hardware.
PRODUCT DATA SHEET 5 - Reinforce doors and frames to receive surface-applied hardware per SDI A250.6. Drilling and tapping for surface-applied hardware shall be done at Project site. Provide internal reinforcements for all doors to receive door closers and exit devices where scheduled.
PRODUCT DATA SHEET 6 - Locate hardware as indicated on Shop Drawings or, if not indicated, per the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

SCHEDULE 7 - FINISHES

PRODUCT DATA SHEET 0 - Chemical Treatment: Treat steel surfaces to promote paint adhesion.
PRODUCT DATA SHEET 1 - Exposed door and frame surfaces to be cleaned and treated then coated with rust inhibitive primer. Water-based primer and color paint finishes to be free of Hazardous Air Pollutants (HAPS) and Volatile Organic Compounds (VOCs). Paint to comply with ANSI A250.3 and A250.10.

PART 3 - EXECUTION

SCHEDULE 0 - EXAMINATION

PRODUCT DATA SHEET 0 - Verify that project conditions are acceptable before beginning installation of frames.

3.1 Verify that completed openings to receive knock-down wrap-around frames are of correct size and thickness.

3.2 Verify that completed concrete or masonry openings to receive butt type frames are of correct size.

PRODUCT DATA SHEET 1 - Do not begin installation until conditions have been properly prepared.

PRODUCT DATA SHEET 2 - Correct unacceptable conditions before proceeding with installation.

SCHEDULE 1 - INSTALLATION

PRODUCT DATA SHEET 0 - Install doors and frames in accordance with manufacturer's printed installation instructions and with Steel Door Institute's recommended erection instructions for steel frames SDI A250.11 and NAAMM/HMMA 840.

PRODUCT DATA SHEET 1 - DHI – Door and Hardware Institute – Door Security + Safety Professionals – Installation Guide for Doors and Hardware

PRODUCT DATA SHEET 2 - Fire Doors and Frames: Install in accordance with SDI A 250.11 and NFPA 80.

3.1 To ensure compliance with Positive Pressure criteria as required by UBC7-2, UL10C, NFPA5000 and all applicable Local, State and National Code Jurisdictions, all Doors and Frames should be checked for accurate installation per Manufacturers installation instructions to provide proper fire and Smoke Gasketing as tested and listed.

3.2 Fit hollow-metal doors accurately in frames, within clearances specified in SDI A 250.11 and SDI 100. Install fire rated doors with clearances specified in NFPA 80.

PRODUCT DATA SHEET 3 - Comply with provisions of SDI-105, “Recommended Erection Instructions for Steel Door Frames,” unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.

3.1 Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.

3.2 In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors. Use additional anchors as required for height per manufacturers’ installation instructions.

3.3 At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices. Use additional anchors as required for height per manufacturers’ installation instructions.

3.4 In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws. Secure Sill Anchors to floor. Use additional anchors as required for height per manufacturers’ installation instructions.

3.5 Drywall series frames are designed for installation in interior applications after construction of wood or metal stud and drywall applications. Drywall series frames are provided with adjustable jamb lock anchors for secure installation. Install frames per manufacturers' installation instructions. Adjust anchors and secure sill and baseboard anchors as provided.

PRODUCT DATA SHEET 4 - To comply with the Texas Department of Insurance TDI –

3.1 Wall Framing Construction: The door assemblies may be mounted to several types of wall framing construction. The types of wall framing construction allowed include:

A. Concrete (minimum compressive strength: 3,000 psi)
B. Grout filled concrete block
C. Hollow concrete block
D. Steel (minimum 1/8", Fy = 36 ksi)
E. Aluminum (minimum 1/8" thick, 6063-T6)
F. Wood (Spruce-Pine-Fir, minimum S.G. = 0.42)

3.2 Fastener Requirements:

A. Refer to the approved drawings for the anchor layout and notes.
B. Refer to the approved drawings for the minimum embedment depths for the fasteners and the minimum edge distances (minimum distance fastener must be from the edge of the substrate material) for the fasteners.

PRODUCT DATA SHEET 5 - Remove temporary steel spreaders prior to installation of frames.

PRODUCT DATA SHEET 6 - Set frames accurately in position; plumb, align and brace until permanent anchors are set. After wall construction is complete, remove temporary wood spreaders.

3.1 Field splice only at approved locations indicated on the shop drawings.
3.2 Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.

PRODUCT DATA SHEET 7 - Provide full height 3/8 inch (9.5 mm) to 1-1/2 inch (38 mm) thick strip of polystyrene foam blocking at frames requiring grouting. Apply the strip to the back of the frame to facilitate field drilling or tapping.

PRODUCT DATA SHEET 8 - Grouting Hollow Metal Frames:

3.1 Provide bituminous coating on interior of grout filled jambs.
3.2 Provide and install temporary bottom and intermediate wood spreaders to maintain proper width and avoid bowing or deforming of frame members. Refer to ANSI A250.11-2001 and NAAMM/HMMA 840.
3.3 Comply with ANSI/SDI Standard A250.8, paragraph 4.2.2, and HMMA 820 TN01 Grouting Hollow Metal Frames, whereby grout will be mixed to provide a 4 inch (102 mm) maximum slump consistency and hand toweled into place. Do not use grout mixed to a thinner consistency.
3.4 Provide a vertical wood brace during grouting of frame at openings over 4 foot (1219 mm) wide, to prevent sagging of frame header.

PRODUCT DATA SHEET 9 - Glaze and seal exterior transom, sidelight and window frames in accordance with HMMA-820 TN03.

PRODUCT DATA SHEET 10 - Apply hardware in accordance with hardware manufacturers'

instructions and Section 087100 of these Specifications. Install hardware with only factory-provided fasteners. Install silencers. Adjust door installation to provide 1/8" at head and 1/8" at strike and hinge jamb with door undercut to meet fire ratings and floor conditions to achieve maximum operational effectiveness and appearance.

SCHEDULE 2 - FIELD QUALITY CONTROL

PRODUCT DATA SHEET 0 - Fire-Rated Door Assembly Testing:

3.1 Upon completion of the installation, test each fire door assembly to confirm proper operation of its closing device and verify that it meets all criteria of a fire door assembly per NFPA 80.

3.2 Perform inspections by individuals with documented knowledge and understanding of the operation components of the type of door being tested per NFPA 80 and NFPA 101.

3.3 Provide a written record to the Owner with copies available to the Authorities Having Jurisdiction (AHJ).

3.4 Record shall list the fire door assembly and include the door number with an itemized list of hardware set components for each door opening and location in the facility.

SCHEDULE 3 - ADJUST AND CLEAN

PRODUCT DATA SHEET 0 - Adjust doors for proper operation, free from binding or other defects.

PRODUCT DATA SHEET 1 - Clean and restore soiled surfaces. Remove scraps and debris and leave site in a clean condition.

PRODUCT DATA SHEET 2 - Prime Coat Touch-Up: Immediately after erection, sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.

PRODUCT DATA SHEET 3 - Properly clean and apply paint to doors and frames in accordance with HMMA-840 TN01 and ANSI A250.8 appendix B along with Manufactures recommended surface preparation for painting.

SCHEDULE 4 - PROTECTION

PRODUCT DATA SHEET 0 - Protect installed products and finished surfaces from damage during construction.

END OF SECTION

SECTION 081416

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes: Solid core flush wood doors with veneer faces.

B. Related Sections:

1. Division 8 Section - "Hollow Metal Doors and Frames."
2. Division 8 Section - "Door Hardware."
3. Division 8 Section – "Glazing."

1.3 SUBMITTALS:

A. Product Data: Submit door manufacturer’s technical data for each type of door and frame, including details of core and edge construction, and trim for openings and louvers.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Show locations of cutouts.
3. Dimension and detail glass lite openings.
4. Indicate requirements for factory finishing and machining.
5. Indicate fire ratings for fire doors.
6. Use same reference numbers indicated on contract drawings in preparing schedules.

C. Samples:

1. For Initial Selection: Submit manufacturer's full range sample charts of factory-finished doors for selection.
2. For Verification: Submit sample of selected factory finish applied to actual door face materials, approximately 8 by 10 inches for each material and finish.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

1. WDMA Quality Standard: I.S. 1-A Series, "Industry Standard for Wood Flush Doors" of Window and Door Manufacturers Association (WDMA).

2. AWI Quality Standard: "Architectural Woodwork Standards", 1st Edition, including Section 9 "Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. WDMA Quality Marking:

1. Mark each wood door with WDMA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of WDMA I.S. 1-A Series.

2. For manufacturers not participating in WDMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. Single Source Limitations: Obtain doors from a single manufacturer, selecting from specified manufacturers listed herein.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches (1000 mm) or less above the sill.

2. Smoke and Draft Control: Fire rated door assemblies shall be 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.

1.5 DELIVER, STORAGE AND HANDLING:

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors" as well as with manufacturer's instructions.

B. Package factory finished doors individually in opaque plastic bags or cardboard cartons.

C. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS:

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.7 WARRANTY:

A. General: Warranties shall run concurrently with, be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents or otherwise.

B. Door Manufacturer's Warranty:

1. Submit written agreement on door manufacturer's standard form signed by

Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist), or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

2. Warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
3. Warranty shall commence on date of Substantial Completion.
4. Warranty Period for Solid-Core Interior Doors: Life of installation

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with requirements, provide doors by one of the following:
1. Eggers Industries, Architectural Door Division.
2. Graham / ASSA ABLOY Group.
3. Marshfield-Algoma / Masonite Architectural.
4. Oshkosh Architectural Door Co.
5. VT Industries, Inc.

2.2 INTERIOR FLUSH WOOD DOORS:

A. Veneer-Faced Door Construction: Five plies with stiles and rails bonded to core material, then entire unit abrasive planed before veneering.
1. Bonding Method: Faces veneers bonded to core using a hot press.
2. Door Thickness: 1-3/4 inch, unless otherwise indicated.
3. AWI Grade: Premium.
4. Faces for Transparent Finish: White Oak, Plain Sliced.
a. Veneer Grade: Grade A faces.
b. Veneer Matching: Book matched, center matched.
c. Appearance: Veneer face shall be consistent with similar color and appearance at both sides of doors, with no green or brown colored wood.

B. Solid Particleboard Core Doors: PC-5 (Particle board core, 5-ply, hot-pressed method).
1. Particleboard: ANSI A208.1, Grade LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:
a. 5-inch top-rail blocking, in doors indicated to have closers.
b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

c. 5-inch midrail blocking, in doors indicated to have exit devices or provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

C. Fire-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. 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.
3. Fire Pressure Edge Sealing System: Manufacturer's concealed integral intumescent seals located behind stiles and endrail designed to meet requirements for Category A positive pressure fire test method.

D. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
   a. 5-inch top-rail blocking.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
   c. 5-inch midrail blocking, in doors indicated to have armor plates.
   d. 5-inch midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 LIGHT FRAMES AND MOLDINGS:

A. Wood Beads for Light Openings in Wood Doors:

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. Fire-Rated Applications: At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.4 FABRICATION:

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3.

1. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
2. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
3. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Light Openings:

1. Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind of door required.
2. Trim light openings with moldings of material and profile indicated.
3. Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 8 Section – "Glazing."

2.5 FACTORY FINISHING

A. Factory finish doors that are indicated to receive transparent finish.

B. Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

C. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

D. Transparent Finish:

1. Grade: Premium.
2. Finish: Manufacturer's standard finish with performance comparable to AWI System 5 - Conversion Varnish or AWI System 11 - Catalyzed Polyurethane.
   a. Stain: As selected by Architect from manufacturer's full range.
   b. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine doors, frames and rough openings, with Installer present, before starting installation of frames and hanging doors.

1. Verify that doors and frames comply with indicated requirements for type, size, location, and swing characteristics.
2. Reject doors and frames with defects.

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

3.2 INSTALLATION:

A. Install doors complying with manufacturer's written instructions, referenced quality standard, and final reviewed shop drawings.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

D. Hardware Installation: Comply with Division 7 Section "Door Hardware."

1. Install doors using approved hardware as scheduled.
2. Use threaded-to-the-head wood screws furnished by hardware manufacturer to mount hardware to doors and frames. Drill pilot holes for all screws prior to installation.
3. Attach hardware secure in correct position and alignment for proper function.

3.3 ADJUSTING, CLEANING AND PROTECTION:

A. Upon door installation, verify for proper operation, fit and swing. Make adjustments as required to ensure for smooth, quiet operation. Re-hang or replace doors which bind or sag.

B. Replace doors that are damaged or do not comply with specified requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

C. Provide protective measures to ensure that installed doors will be without damage, soils or stains throughout remainder of construction.

D. Clean finished door and frame surfaces free of dust, smudges, soils and similar contaminations during final cleaning in accordance with finish manufacturer's recommendations.

END OF SECTION 081416

SECTION 083113

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section includes access doors for installation in the following types of construction:
   1. Gypsum drywall.
   2. Unit masonry.
   3. Other construction as otherwise indicated.

B. Provide fire-rated access doors where indicated or scheduled, and at access openings at walls and ceilings indicated or required by building code to be fire-rated.

C. Related Sections:
   1. Division 3 Section - "Concrete"
   2. Division 4 Section - "Unit Masonry"
   3. Division 5 Section – "Cold-Formed Metal Framing."
   4. Division 6 Section - "Rough Carpentry"
   5. Division 7 Section - "Joint Sealants"
   6. Division 9 Section - "Gypsum Board Assemblies"
   7. Division 9 Section - "Painting"
   8. Divisions 22, 23 and 26 Sections (additional access doors provided and installed by Contractors for Plumbing, Mechanical, Electrical, and related work).

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of access door assembly.
   1. Include setting drawings, templates, instructions, and directions for installation of anchorage, devices.
   2. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.

B. Shop Drawings: Submit drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Obtain access doors for entire project from a single

manufacturer and from one source.

B. Fire-Rated Access Doors and Frames: Provide assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated and tested according to NFPA 252 or UL 10B.

1. Fire-Rated assemblies shall be labeled and listed by Underwriters Laboratories, Inc. (UL), Intertek Warnock Hersey (WH-ETL), or another testing and inspecting agency acceptable to authorities having jurisdiction and bear identification markings indicating ratings.
2. Assembly rating shall equal or exceed fire rating of construction in which it is installed.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

D. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS:

A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

B. Special-Size Access Doors: Use where required or requested; indicate on schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS/PRODUCTS:

A. Acceptable Manufacturers; subject to compliance with requirements, provide access doors by one of the following:

1. Cesco Products / Div. Mestik, Inc.
2. J.L. Industries, Inc.
3. Karp Associates, Inc.
4. Larsens Manufacturing Co.
5. Milcor / Hart & Cooley, Inc.
6. Nystrom, Inc.
7. The Williams Brothers Corp.

2.2 MATERIALS AND FABRICATION:

A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

C. Frames: Fabricate from 16-gage galvanized steel, or 18-gage stainless steel with No. 4 satin finish, to match doors required at various locations.

1. Fabricate frame with exposed flange, nominal 1-inch wide around perimeter of frame for units installed in the following construction:

a. Exposed masonry.

b. Exposed concrete.

2. For gypsum drywall, furnish perforated flange frames with drywall bead.

D. Painted Flush Panel Doors (non-fire-rated and fire-rated): Fabricate from not less than 16-gage galvanized sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees.

1. Finish with manufacturer's factory-applied prime paint.

2. Restore any damage to galvanized finish with cold-process galvanizing repair paint, prior to applying factory prime coating, or other finishes.

E. Stainless Steel Flush Panel Doors: Fabricate from not less than 18-gage stainless steel sheet, with concealed spring hinges or concealed piano hinge set to open 175 degrees. Buff exposed surfaces to #4 satin finish, except where other finishes are indicated.

F. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

G. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

H. Finishes:

1. Exterior: Two-coat fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat.

a. Coating System Thickness: Minimum 1.2-mil dry film thickness; consisting of 0.3 (±0.1) mil primer and minimum 1.0-mil color coat.

b. Color: As selected by Architect from manufacturer's full range selection containing not less than fifteen (15) standard colors.

2. Interior, Exposed to Normal View: To match finish of construction to which it is installed.

3. Interior, in Service Areas and Above Ceilings: Factory primed baked enamel.

4. Toilet Rooms, Janitors Rooms, and Break Rooms: Stainless steel, No. 4, satin finish.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Comply with manufacturer's current written instructions and recommendations for installation of access doors.

B. Coordinate installation with work of other trades.

C. Prepare perimeter of rough openings in concrete, CMU, and other similar masonry with mortar/grout full-depth of wall and to size required; use pressure-treated wood as

necessary for other concealed blocking, grounds, and supports at any stud wall construction.

D. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.2 ADJUST AND CLEAN:

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Insulated service doors.

B. Related Requirements:

   1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling 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.
   2. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance data.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. 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.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors 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 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
1. Testing: According to **or** DASMA 102 for garage doors and complying with acceptance criteria of DASMA 102.

2.2 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Acceptable Manufacturer’s

a. Overhead Door Corporation.
b. Arm-R-Lite.
c. Martin Door Manufacturing.
d. Raynor.
e. Rite-Hite Corporation.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000.

C. Insulated Door Curtain R-Value: 7.35.

D. Insulated Door Assembly U-Factor: 0.136

E. Door Curtain Material: Galvanized steel.

F. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height.
1. Insulated-Slat Interior Facing: Metal.

G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch; fabricated from hot-dip galvanized steel and finished to match door.

H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish.

1. Mounting: Face of wall.

J. Locking Devices: Equip door with slide bolt for padlock.

1. Locking Device Assembly: Single-jamb side.

K. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
3. Motor Exposure: Interior.
4. Motor Electrical Characteristics:

a. Horsepower: 1 hp.
b. Voltage: 208 V ac, single phase, 60 Hz

5. Emergency Manual Operation: Chain type.
6. Obstruction-Detection Device: Automatic photoelectric sensor.
7. Control Station(s): Interior mounted.

L. Curtain Accessories: Equip door with weatherseals.

M. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Factory Prime Finish: Manufacturer's standard color.
3. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 MATERIALS, GENERAL

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.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, 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. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.

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.

2.5 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.

1. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.6 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

B. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches high.

2.8 COUNTERBALANCE 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 either cast iron or cold-rolled steel plate.

2.9 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

D. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

E. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

F. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

G. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency

manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Power-Operated Doors: Install according to UL 325.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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. Section Includes:
1. Exterior and interior aluminum storefront systems.
2. Exterior and interior aluminum entrance doors.

B. Related Sections:
1. Division 8 Section - "Door Hardware."
2. Division 8 Section - "Glazing."
3. Division 7 Section - "Joint Sealants."

1.3 DESIGN AND PERFORMANCE REQUIREMENTS:

A. System Design Requirements: Manufacturer shall design and provide comprehensive engineering analysis for exterior aluminum-framed entrances and storefront systems complying with specified design and performance requirements

B. System 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. Deflection exceeding specified limits.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Glass breakage.
e. Noise or vibration created by wind and thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Failure of operating units.

C. Structural Loads: Wind loads and other loads as indicated on Drawings.

D. Deflection of Framing Members: Not less than the following specified limits at design wind pressure.

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13-feet 6-inches and to 1/240 of clear span plus 1/4-inch for spans greater than 13-feet 6-inches 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 amount not exceeding that which reduces glazing bite to less than 75-percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8-inch, and minimum 1/16-inch clearance to operable units.

E. Structural Test Performance: Tested 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 seconds.

F. Air Infiltration: Tested according to ASTM E 283 for infiltration maximum air leakage specified.

1. Fixed Framing and Glass Area: 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 1.57 lbf/sq. ft.

G. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20-percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

1. No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation shall be permitted.
2. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. 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 0.45 Btu/sq. ft. $\times$ h $\times$ 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 0.25 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 60 as determined according to NFRC 500.

I. Thermal Movements: Storefront and entrance systems shall be designed to allow for thermal movements resulting from ambient and surface temperature changes as specified.
1. Temperature Change: 120-deg F (67 deg C), ambient; 180-deg F (100 deg C), material surfaces.
2. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and specifications indicating material descriptions, dimensions of individual components and profiles, fabrication methods, finishes, hardware requirements and accessories. Include installation instructions.

B. Shop Drawings: Submit For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Design Analysis: Submit comprehensive engineering analysis for exterior aluminum-framed storefront and entrance systems indicating compliance with specified design and performance requirements.

D. Samples:
1. For Initial Selection: Submit for units with factory-applied color finishes.
2. For Verification: Submit for each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Submit typical vertical-to-horizontal intersection of assembly, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.

4. Glazing.
5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Submit schedule prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Qualification Data: Submit for installer, qualified Professional Engineer and field testing agency to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. (Submit for Architect's information only.)

H. Energy Performance Certificates: Submit for aluminum-framed storefronts, accessories, and components, from manufacturer. Basis for Certification shall be NFRC-certified energy performance values for each aluminum-framed storefront. (Submit for Architect's information only.)

I. Sealant Compatibility and Adhesion Test Reports: Submit reports from sealant manufacturer indicating that framing materials have been tested for compatibility and adhesion with sealants. Include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion. (Submit for Architect's information only.)

J. Product Test Reports: Submit reports for aluminum-framed entrances and storefronts based on evaluation of comprehensive tests performed by a qualified testing agency. (Submit for Architect's information only.)

K. Field Quality-Control Reports: Submit inspection and field test reports indicating results of field testing. (Submit for Architect's information only.)

L. Maintenance Data: Submit cleaning and maintenance for aluminum-framed storefront and entrance systems to include in maintenance manuals. Include with closeout submittals.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer shall have at least five (5) years' verifiable experience and who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of aluminum-framed storefront and entrance systems that are similar in material, design, and extent to those indicated for this Project. Engineer's service shall include review of shop drawings.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies.

1. 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.
2. 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.

E. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from a single manufacturer and from a single source.

1.6 MOCK-UPS:

A. Job Mock-Up: Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical storefront wall area at location on building as directed by Architect. Construct at least one full height by width of two glazed panels framed with vertical and horizontal mullions of exterior storefront system.
2. Mock-up shall indicate the following:
   a. Mullion connections.
   b. Structural anchorage.
   c. Steel reinforcing, if required by design.
   d. Framing finish.
   e. Glazing materials.
   f. Flashing and weeping provisions
3. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect specifically approves such deviations in writing.
4. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion, subject to compliance with requirements.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on shop drawings.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 WARRANTIES:

A. Manufacturer's 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. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.
2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with requirements, provide products by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Arconic company.
3. Trulite Glass & Aluminum Solutions, LLC.
4. Tubelite, Inc.
5. United States Aluminum Corp.
6. Vistawall International / Oldcastle Building Envelope Group.
7. YKK AP America Inc.

2.2 MATERIALS:

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.

5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Provide as required by manufacturer's engineering analysis.

1. Materials:
   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. Finish: Provide with 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.

2.3 STOREFRONT FRAMING SYSTEMS:

A. Basis of Design:

1. Exterior Framing System: Kawneer; Trifab VG 451T.
2. Interior Framing System: Kawneer, Trifab 400.
3. Framing systems of similar design and construction by other acceptable manufacturers may be submitted for Architect's acceptance. Acceptance is subject to compliance with specified requirements as evidenced by submittal of manufacturer's product data, test reports and shop drawings.

B. Framing System Design:

1. Exterior Framing Systems: Front set, flush glazed tubular framing system designed for dry glazing with roll-in top load elastomeric glazing gaskets on all sides. Thermal broken framing construction fabricated to accept insulated glass units.
2. Interior Framing System: Center set, flush glazed tubular framing system designed for dry glazing with roll-in top load elastomeric glazing gaskets on all sides. Non-thermal construction fabricated to accept single pane glass units.

C. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Member Sizes:
   a. Exterior Framing Systems: 2-inch face width by 4-1/2 inch depth.
   b. Interior Framing System: 1-3/4 inch face width by 4-inch depth.
2. Thermal Barrier: Manufacturer's thermal break for exterior framing members consisting of a two-part chemical cured, high-density polyurethane material attached to aluminum framing by mechanical and adhesive joining methods.
3. Assembly Method: Shear–block or head-and-sill-receptor system with shear-blocks at intermediate horizontal members.
4. Finish: Color anodized finish as specified.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Head Deflection Receptors: Manufacturer's standard receptors at heads designed to compensate for excessive deflection of structure. Provide as required by manufacturer's engineering analysis for job conditions as indicated on final reviewed shop drawings.

G. Sill Flashing or Receptor: Fabricated from minimum 0.062-inch thickness aluminum; matching storefront framing finish of type with interior legs turned up minimum 1-inch against framing member and with end dams to form watertight gutter. Seal all aluminum to aluminum laps with sealant.

H. Trim and Closures: Provide exterior and interior trim and closure components in materials and finishes matching storefront framing for complete installation. Trim components shall be attached without use of exposed fasteners.

I. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 ENTRANCE DOOR SYSTEMS:

A. Entrance Doors: Manufacturer's standard glazed entrance doors of design indicated for manual-swing operation.
   1. Door Design: Wide stile, swing doors.
   2. Stiles and Rails: Dimensions indicated are nominal sizes.
      a. Stiles: 5-inches width.
      b. Top rail: 5-inches width.
      c. Bottom rail: 10-inches width.
   3. Door Construction: 1-3/4 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.
   4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
      a. Provide infill adapters to accept insulated glazing for exterior entrances.
      b. Provide non-removable glazing stops on exterior side of door.

B. Entrance Door Hardware: As specified in Division 8 Section "Door Hardware".

C. Weather Stripping: Manufacturer's standard replaceable components.
   1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
   2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.5 GLAZING SYSTEMS:

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, black, resilient elastomeric glazing gaskets designed to maintain uniform pressure and watertight seal.

C. Setting Blocks and Spacers: Manufacturer's standard elastomeric types.

D. Glazing Sealants: Comply with Division 8 Section "Glazing."

2.6 ACCESSORIES:

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Fasteners shall be concealed to the greatest extent practicable. Where exposed fasteners are required, use type with countersunk Phillips screw heads, finished to match framing system. Limit exposed fasteners only to locations indicated on final reviewed shop drawings.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

F. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION:

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from [exterior] [interior] [interior for vision glass and exterior for spandrel glazing or metal panels].
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. Storefront Framing: Fabricate components for framing assembly method specified.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. Provide compression weather stripping at fixed stops at exterior doors,
2. Provide silencers at stops to prevent metal-to-metal contact at interior doors. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. Provide sliding-type weather stripping retained in adjustable strip and mortised into door edge at pairs of exterior doors.
2. Provide weather sweeps applied to door bottoms at exterior doors.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to shop drawings.

2.8 ALUMINUM FINISHES:

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Exterior and Interior Storefront Systems and Entrances: Color anodized finish complying with AAMA 611; AA-M12C22A42/A44, Class I.
1. Coating Thickness: Minimum 0.70 mils (0.018 mm).
2. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.
   1. Do not install damaged components.
   2. Fit joints to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   5. 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 Division 7 Section "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Division 8 - "Glazing."

F. Install perimeter joint sealants as specified in Division 7 Section -"Joint Sealants." Caulk both exterior and interior faces around perimeter of storefront framing with specified sealant.

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points. Install door units to prepared openings level and plumb, anchored secured in position and without distortion.
   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 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8-inch in 10-feet; 1/4-inch in 40-feet.
2. Level: 1/8-inch in 20-feet; 1/4-inch in 40-feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch wide, limit offset from true alignment to 1/16-inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1-inch wide, limit offset from true alignment to 1/8-inch.
   c. Where surfaces are separated by reveal or protruding element of 1-inch wide or more, limit offset from true alignment to 1/4-inch.
4. Location: Limit variation from plane to 1/8-inch in 12-feet; 1/2-inch over total length.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform field quality-control tests and inspections, including preparing reports.

B. Water-Spray Test: Before installation of interior finishes has begun, representative areas of aluminum-framed entrances and storefronts designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

1. Test Area: Perform tests on minimum area of at least 10 feet length, by one story of aluminum storefront system.
2. Perform test in areas as directed by Architect.
3. Test shall be performed in the presence of the Architect.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

1. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
2. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports for submittal to Architect.

3.5 ADJUSTING AND CLEANING:

A. Entrance Door Adjustments:

1. Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
2. Adjust installed weatherstripping to provide weathertight seal around perimeter of door opening.

3. Doors accessible to people with disabilities, shall have closers adjusted to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3-inches from the latch measured to the leading door edge.

B. General Cleaning: Maintain aluminum storefront assembly in clean condition during construction period. Immediately remove stains or materials having adverse effect on storefront materials and finishes. Remove excess glazing and sealant compounds.

C. Final Cleaning: Just prior to Date of Substantial Completion, clean entire storefront assembly and each exposed face side of metal framing.

1. Clean using pre-tested detergent and water. Flush with clean water.
2. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

END OF SECTION 084113

SECTION 084413

GLAZED ALUMINUM CURTAIN WALL SYSTEM

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. Section Includes:
1. Glazed aluminum curtain wall system, including aluminum entrances.

B. Related Sections:
1. Division 8 Section - "Door Hardware."
2. Division 8 Section - "Glazing."
3. Division 7 Section - "Joint Sealants."

1.3 DESIGN AND PERFORMANCE REQUIREMENTS:

A. System Design Requirements: Manufacturer shall design and provide comprehensive engineering analysis for exterior aluminum-framed entrances and storefront systems complying with specified design and performance requirements

B. System 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. Glazed aluminum curtain walls and entrances 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. Deflection exceeding specified limits.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Glass breakage.
e. Noise or vibration created by wind and thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Failure of operating units.

C. Structural Loads: Wind loads and other loads as indicated on Drawings.

D. Deflection of Framing Members: Not less than the following specified limits at design wind pressure.
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13-feet 6-inches and to 1/240 of clear span plus 1/4-inch for spans greater than 13-feet 6-inches 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 amount not exceeding that which reduces glazing bite to less than 75-percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8-inch, and minimum 1/16-inch clearance to operable units.

E. Structural Test Performance: Tested 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 seconds.

F. Air Infiltration: Tested according to ASTM E 283 for infiltration maximum air leakage specified.
   1. Fixed Framing and Glass Area: 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 1.57 lbf/sq. ft.

G. Water Penetration:
   1. Under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20-percent of positive wind-load design pressure, but not less than 12-lbf/sq. ft.
   2. Under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20-percent of positive wind-load design pressure, but not less than 12-lbf/sq. ft.
      a. No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation shall be permitted.
      b. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. 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 0.45 Btu/sq. ft. × h × 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 0.25 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 60 as determined according to NFRC 500.

I. Thermal Movements: Storefront and entrance systems shall be designed to allow for thermal movements resulting from ambient and surface temperature changes as specified.
1. Temperature Change: 120-deg F (67 deg C), ambient; 180-deg F (100 deg C), material surfaces.
2. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and specifications indicating material descriptions, dimensions of individual components and profiles, fabrication methods, finishes, hardware requirements and accessories. Include installation instructions.

B. Shop Drawings: Submit for aluminum curtain wall and entrance systems. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Show entrances and indicate hardware preparation requirements.
3. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.
4. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. Indicate that the qualified professional engineer providing design analysis has reviewed shop drawings.

C. Design Analysis: Submit comprehensive engineering analysis for exterior aluminum-framed storefront and entrance systems indicating compliance with specified design and performance requirements.

D. Samples:
1. For Initial Selection: Submit for units with factory-applied color finishes.
2. For Verification: Submit for each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Submit typical vertical-to-horizontal intersection of assembly, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Submit schedule prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Qualification Data: Submit for installer, qualified Professional Engineer and field testing agency to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. (Submit for Architect's information only.)

H. Energy Performance Certificates: Submit for aluminum-framed storefronts, accessories, and components, from manufacturer. Basis for Certification shall be NFRC-certified energy performance values for each aluminum-framed storefront. (Submit for Architect's information only.)

I. Sealant Compatibility and Adhesion Test Reports: Submit reports from sealant manufacturer indicating that framing materials have been tested for compatibility and adhesion with sealants. Include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion. (Submit for Architect's information only.)

J. Product Test Reports: Submit reports for aluminum-framed entrances and storefronts based on evaluation of comprehensive tests performed by a qualified testing agency. (Submit for Architect's information only.)

K. Field Quality-Control Reports: Submit inspection and field test reports indicating results of field testing. (Submit for Architect's information only.)

L. Maintenance Data: Submit cleaning and maintenance for aluminum-framed storefront and entrance systems to include in maintenance manuals. Include with closeout submittals.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer shall have at least five (5) years' verifiable experience and who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project with a record of successful in-service performance.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of aluminum-framed storefront and entrance systems that are similar in material, design, and extent to those indicated for this Project. Engineer's service shall include review of shop drawings.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies.

1. 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.
2. 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.

E. Source Limitations: Obtain all components of aluminum curtain wall and entrance systems, including framing and accessories, from a single manufacturer and from a single source.

F. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

G. Accessible Entrances: Comply with applicable provisions of the following regulations and standards.

1. Code of Federal Regulations (CFR), Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
2. ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities.

1.6 MOCK-UPS:

A. Job Mock-Up: Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical storefront wall area at location on building as directed by Architect. Construct at least one full height by width of two glazed panels framed with vertical and horizontal mullions of exterior storefront system.
2. Mock-up shall indicate the following:
   a. Mullion connections.
   b. Structural anchorage.
   c. Steel reinforcing, if required by design.
   d. Framing finish.
   e. Glazing materials.
   f. Flashing and weeping provisions

3. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect specifically approves such deviations in writing.
4. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion, subject to compliance with requirements.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on shop drawings.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum curtain wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 WARRANTIES:

A. Manufacturer's 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. Failures include, but are not limited to, the following:
a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.
2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with requirements, provide products by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Arconic company.
3. Trulite Glass & Aluminum Solutions, LLC.
4. Tubelite, Inc.
5. United States Aluminum Corp.
6. Vistawall International / Oldcastle Building Envelope Group.
7. YKK AP America Inc.

2.2 MATERIALS:

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Provide as required by manufacturer's engineering analysis.

1. Materials:
   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. Finish: Provide with 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.

2.3 CURTAIN WALL FRAMING SYSTEMS:

A. Basis of Design: Kawneer, 1600 Wall System 1.

1. Curtain wall systems of similar design and construction by other acceptable manufacturers may be submitted for Architect's acceptance.
2. Acceptance is subject to compliance with specified requirements as evidenced by submittal of manufacturer's product data, test reports and shop drawings.

B. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Member Sizes: 2-1/2 inch face width by 7-inch, minimum, to 7-1/2 inch, maximum, depth.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Construction: Thermally broken.
5. Finish: Color anodized finish as specified.

6. Fabrication Method: Either factory or field-fabricated system.

C. Mullion Face Caps: Provide manufacturers standard profile exterior cover caps for vertical and horizontal mullions.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS:

A. Entrance Doors: Manufacturer's standard glazed entrance doors of design indicated for manual-swing operation.
1. Door Design: Wide stile, swing doors.
2. Stiles and Rails: Dimensions indicated are nominal sizes.
a. Stiles: 5-inches width.
b. Top rail: 5-inches width.
c. Bottom rail: 10-inches width.
3. Door Construction: 1-3/4 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.
4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
a. Provide infill adapters to accept insulated glazing for exterior entrances.
b. Provide non-removable glazing stops on exterior side of door.

B. Entrance Door Hardware: As specified in Division 8 Section "Door Hardware".

C. Weather Stripping: Manufacturer's standard replaceable components.
1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.5 GLAZING SYSTEMS:

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: Comply with Division 8 Section "Glazing."

2.6 ACCESSORIES:

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Fasteners shall be concealed to the greatest extent practicable. Where exposed fasteners are required, use type with countersunk Phillips screw heads, finished to match framing system. Limit exposed fasteners only to locations indicated on final reviewed shop drawings.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Framing Sealants: Manufacturer's standard sealants.

F. Perimeter Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

G. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION:

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Fabricate components to resist water penetration for pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to the exterior.

E. Curtain-Wall Framing: Fabricate components for specified assembly method.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. Provide compression weather stripping at fixed stops at exterior doors,
2. Provide silencers at stops to prevent metal-to-metal contact at interior doors. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. Provide sliding-type weather stripping retained in adjustable strip and mortised into door edge at pairs of exterior doors.
2. Provide weather sweeps applied to door bottoms at exterior doors.

H. Clearances for Operable Door Units: Provide a minimum 1/16-inch clearance between framing members and operable doors.

I. 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.

J. After fabrication, clearly mark components to identify their locations in Project according to shop drawings.

2.8 ALUMINUM FINISHES:

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Exterior and Interior Storefront Systems and Entrances: Color anodized finish complying with AAMA 611; AA-M12C22A42/A44, Class I.

1. Coating Thickness: Minimum 0.70 mils (0.018 mm).
2. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.
   1. Do not install damaged components.
   2. Fit joints to produce hairline joints free of burrs and distortion.
   3. Rigidly secure nonmovement joints.
   4. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   5. Seal perimeter and other joints watertight unless otherwise indicated. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding
   6. Seal 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 primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Install door units level and plumb, securely anchored, and without distortion.
   2. Adjust weather-stripping contact and hardware movement to produce proper operation and weathertight enclosure.
   3. Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

F. Install glazing as specified in Division 8 "Glazing."
   1. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants." Caulk both exterior and interior faces around perimeter of curtain wall framing with specified sealant.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8-inch in 10-feet; 1/4-inch in 40-feet.
   2. Level: 1/8-inch in 20-feet; 1/4-inch in 40-feet.
   3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch wide, limit offset from true alignment to 1/16-inch.
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1-inch wide, limit offset from true alignment to 1/8-inch.
c. Where surfaces are separated by reveal or protruding element of 1-inch wide or more, limit offset from true alignment to 1/4-inch.

4. Location: Limit variation from plane to 1/8-inch in 12-feet; 1/2-inch over total length.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform field quality-control tests and inspections, including preparing reports.

B. Water-Spray Test: Before installation of interior finishes has begun, representative areas of aluminum-framed entrances and storefronts designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

1. Test Area: Perform tests on minimum area of at least 10 feet length, by one story of aluminum storefront system.
2. Perform test in areas as directed by Architect.
3. Test shall be performed in the presence of the Architect.

C. Glazed aluminum curtain wall and entrance system will be considered defective if they do not pass tests and inspections.

1. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
2. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports for submittal to Architect.

3.5 ADJUSTING AND CLEANING:

A. Entrance Door Adjustments:

1. Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
2. Adjust installed weatherstripping to provide weathertight seal around perimeter of door opening.
3. Doors accessible to people with disabilities, shall have closers adjusted to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3-inches from the latch measured to the leading door edge.

B. General Cleaning: Maintain aluminum curtain wall assembly in clean condition during construction period. Immediately remove stains or materials having adverse effect on aluminum curtain wall and entrance materials and finishes. Remove excess glazing and sealant compounds.

C. Final Cleaning: Just prior to Date of Substantial Completion, clean entire storefront assembly and each exposed face side of metal framing.

1. Clean using pre-tested detergent and water. Flush with clean water.
2. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

END OF SECTION 084413

SECTION 084523

FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum-framed assemblies incorporating fiberglass-sandwich panel systems as follows:

1. Wall assemblies.
2. Skylights.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, profiles, and finishes for aluminum components of panel assemblies.

B. Shop Drawings: For panel assemblies.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: Manufacturer's standard color sheets, indicating full range of available colors for each type of exposed finish.

D. Samples for Verification: Actual sample of finished products for each type of exposed finish.

1. 7 by 12-inch (178 by 305-mm) of each type of fiberglass-sandwich panel.
2. 3-inch (76-mm) long of each type of exposed finish for framing members.

E. Sustainable Design Submittals:

1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index (SRI) requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each fiberglass-sandwich-panel assembly, for tests performed by a qualified testing agency.

1. Flame spread and smoke developed UL card in accordance with UL 723.
2. Burn extent in accordance with Color difference in accordance with ASTM D2244.
4. Impact strength in accordance with UL 972.
5. Bond tensile strength in accordance with ASTM C297 after aging by ASTM D1037.
6. Bond shear strength in accordance with ASTM D1002.
7. Beam bending strength" in accordance with ASTM E72.
8. U-Factor in accordance with NFRC 100.
9. Visible light transmittance in accordance with NFRC 202.
10. Solar heat gain coefficient" (SHGC) in accordance with NFRC 201 or using calculations.
11. Condensation resistance factor for thermally broken, insulated panels in accordance with AAMA 1503.
12. Air leakage in accordance with ASTM E283.
13. Structural performance in accordance with ASTM E330.
14. Water penetration in accordance with ASTM E331.
15. Fire penetration of exterior wall assemblies using a direct flame impingement exposure in accordance with ASTM E2707.
16. Windborne debris in accordance with ASTM E1886 and ASTM E1996, or TAS 201, TAS 202 and TAS 203.
17. Window performance for walls in accordance with AAMA/WDMA/CSA-101/I.S.2/A440.
18. Daylight modeling report to suit Project.
19. Fall-through resistance for skyroof/unit skylight/canopy only in accordance with ASTM E661.
20. UL-listed Class A, roof covering burning brand test for skyroof/unit skylight/canopy only in accordance with UL 790.
21. UL-listed Class A, roof system in accordance with UL 790; submit UL card.

C. Evaluation Reports: AC177 for fiberglass-sandwich-panel assemblies from ICC-ES.

D. Field quality-control reports.

E. Sample Warranties: For warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: For fiberglass-sandwich panels, a qualified manufacturer whose facilities, processes, and products are monitored by an independent, ANSI-accredited quality-control agency for compliance with applicable requirements in ICC-ES AC177.

B. Installer Qualifications: Entity that employs experienced installers and supervisors who can indicate evidence of satisfactory completion of projects of similar size, scope, and type installing manufacturer's panel assemblies.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies that fail in materials or workmanship within specified warranty period.

1. Panel Assembly Warranty Period: Five years from date of delivery and provided to Owner on date of Substantial Completion.

B. Manufacturer's Extended Warranty: Manufacturer agrees to repair or replace fiberglass-sandwich panels that exhibit defects in materials or workmanship within specified warranty period.

1. Defects include, but are not limited to, the following:

a. Noticeable surface fiber exposure of the exterior face.
b. Color change of exterior face exceeding 8 Delta E.
c. Delamination of panel face sheets from panel cores affecting structural strength.

2. Face Separation from Grid Core Warranty Period: 10 years from date of delivery and provided to Owner on date of Substantial Completion.
3. Glass Fiber External Exposure Warranty Period: 10 years from date of delivery and provided to Owner on date of Substantial Completion.

C. Aluminum Paint Coating Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Failures include, but are not limited to, cracking, peeling, and adhesion failure of paint coating finishes.
2. Warranty Period: **Five** years from date of delivery and provided to Owner on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Loads: As indicated on Drawings.

B. Deflection Limits:

1. Vertical Panel Assemblies: Limited to 1/60 of clear span for each assembly component.
2. Overhead Panel Assemblies: Limited to 1/120 of clear span for each assembly component.

C. Structural-Test Performance: Provide panel assemblies tested in accordance with ASTM E330, as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not indicate evidence of deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not indicate evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

D. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 2 for basic protection.

1. Large-Missile Test: Missile Level C for glazing located within 30 ft. (9.1 m) of grade.
2. Small-Missile Test: Missile Level A for glazing located between 30 ft. (9.1 m) and 60 ft. (18.3 m) above grade.

E. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested in accordance with ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (718 Pa).

F. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.

G. Energy Performance: Provide panel with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated

1. Thermal Transmittance (U-Factor): Fixed translucent panels to have U-factor of not more than 0.23 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.
2. Visible Light Transmittance (VLT): No greater than 26 percent as determined in accordance with NFRC 202.
3. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas to have a SHGC of no greater than **0.26** as determined in accordance with NFRC 201 or calculation.
4. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. (0.05 L/s per sq. m) of fixed wall area as determined in accordance with ASTM E283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
5. Condensation Resistance Factor (CRF): CRF for panel of not less than **80** as determined in accordance with AAMA 1503 and measured on the bond line of thermally broken panels with translucent insulation.

H. Fall-Through Resistance: Complying with OSHA 1910.22 as tested in accordance with ASTM E661; supplemental screens or railings not required.

I. Solar Reflectance Index (SRI): Initial SRI not less than 39 when calculated in accordance with ASTM E1980 or ASTM E903, based on testing identical products by a qualified testing agency.

2.2 FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

A. Fiberglass-Sandwich-Panel Assemblies: Translucent assemblies of insulated composite-structural-sandwich panels made using specially formulated fiberglass reinforced translucent face sheets bonded to grid-core, aluminum-closure system and stiffeners, sized for spans; with or without insulation fill.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation; Facades, Skylights or comparable product by one of the following:

a. Major Industries, Inc.

b. Structures Unlimited, Inc

2.3 FIBERGLASS-SANDWICH PANELS

A. Fiberglass-Sandwich Panels: Uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core.

1. Grid Core Insulation: Fill panel cores with fiberglass batt.

B. Panel Thickness: 2-3/4” inches .

C. Grid Core: Mechanically interlocked muntin, mullion, and perimeter, extruded-aluminum I-beams, with a minimum flange width of 7/16 inch (11.1 mm).

1. Extruded Aluminum: ASTM B221 (ASTM B221M), in Alloy 6063-T5 or T6 as recommended in writing by manufacturer.
2. I-Beam Construction: Flat, thermally broken, extruded aluminum.

a. Thermal Break: Minimum 1-inch- wide, thermoset fiberglass composite.

3. Grid Pattern: As indicated on Drawings.

a. Grid Size: Nominal As indicated on Drawings.

D. Fiberglass-Sandwich-Panel Laminate Adhesive: Heat and pressure resin type adhesive engineered for structural sandwich panel use and complying with ICC "Acceptance Criteria for Sandwich Panel Adhesives."

1. Tensile Strength: Minimum 750 lbf/sq. in. (5.17 MPa) when panel assembly is tested by ASTM C297, after two exposures to six cycles each of aging conditions prescribed by ASTM D1037.
2. Shear Strength: Minimum values in accordance with ASTM D1002, after exposure to four separate conditions:

a. 540 lbf/sq. in. (5.17 MPa) at 50 percent relative humidity (RH) at 68 deg F (37.8 deg C).
b. 100 lbf/sq. in. (689 kPa) at 182 deg F (83.3 deg C).
c. 800 lbf/sq. in. (5.52 MPa) when tested for accelerated aging in accordance with ASTM D1037 at room temperature.

d. 250 lbf/sq. in. (1.72 MPa) when tested for accelerated aging in accordance with ASTM D1037 at 182 deg F (83.3 deg C).

E. Face Sheet:

1. Material: Glass-fiber-reinforced thermoset resins, formulated explicitly for architectural use.

a. Thermoplastic or polycarbonate and acrylic faces are unacceptable.
b. Face sheets to not deform, deflect, or drip when subjected to fire or flame.

2. Exterior Face Sheet:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation; UL Class A Roof, Type A, Windborne Debris, Missile C or comparable product.
b. Color Change of Exterior Face Sheet: Not more than 3.0 units Delta E, when measured in accordance with ASTM D2244, after five years of outdoor South Florida weathering compliant with procedures in ASTM D1435. Test material to not use protective film or coating for long-term color stability. Color stability to be unaffected by abrasion or scratching.

1) Outdoor Weathering Conditions: Sixty months in southern Florida.

c. Impact Resistance of Exterior Face Sheet: No fracture or tear at impact of 70 ft. x lbf diameter, 5 lb (2.3 kg) freefalling ball in accordance with UL 972 test procedure.
d. Thickness: Nominal 0.070 inch.
e. Color: As selected by Architect from manufacturer's full range
f. Erosion Protection Surface: Integral, embedded-glass erosion barrier.

3. Interior Face Sheet:

a. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation; Standard S-171, Crystal or comparable product.
b. Flame-Spread: 50 or less in accordance with ASTM E84 or UL 723.
c. Smoke-Developed Index: 250 or less in accordance with ASTM E84, or 75 or less in accordance with ASTM D2843.
d. Interior Finish Classification of Interior Face Sheet: **Class B** based on testing in accordance with ASTM E84.
e. Combustibility Classification of Interior Face Sheet: Class CC1 based on testing in accordance with ASTM D635.
f. Thickness: Nominal 0.052 inch (1.32 mm).
g. Color: Crystal.

F. Panel Strength:

1. Maximum Panel Deflection: 1.9 inches in 10 ft. (48 mm in 3.05 m) span when a standard panel is tested in accordance with ASTM E72 at 30 lbf/sq. ft. (1.4 kPa).

2. Panel Support Strength: Capable of supporting, without failure, a 300 lbf (1334 N) concentrated load when applied to a 3-inch- (76-mm-) diameter disk in accordance with ASTM E661.

G. Panel Performance:

1. Fire Penetration Resistance of Wall Assembly: Panels comply with ASTM E2707.

a. Absence of flame penetration through wall assembly.
b. Absence of glowing combustion on interior surface of assembly at end of 60-minute observation period.
c. Absence of flame, glow, and smoke when test is terminated prior to completion of 60-minute observation period.

2. Roof-Covering Classification of Exterior Face Sheet: UL-Listed, Class A Roof in accordance with ASTM E108 or UL 790.

2.4 ALUMINUM CLOSURE SYSTEMS

A. General: Comply with manufacturer's fabrication drawings and written instructions for manufacturers standard closure.

B. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken, flat extruded aluminum Alloy 6063-T6 and T5 clamp-tite and screw closure system.

C. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B209 (ASTM B209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).
3. Extruded Structural Pipe and Tubes: ASTM B429/B429M.
4. Structural Profiles: ASTM B308/B308M.

D. Sealing Tape: Manufacturer's standard tape factory-applied to closure system under controlled conditions.

E. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.

1. At closures, retaining caps, or battens, use ASTM A193/A193M, 300 series stainless steel screws.
2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

F. Exposed Flashing and Closures: Aluminum sheet not less than 0.040 inch thick, finished to match framing.

G. Frame-System Sealants: As recommended in writing by manufacturer.

2.5 ACCESSORIES

A. Windborne Debris Resistant Windows for Unitized Fiberglass Panel Assemblies: Complying with AAMA/WDMA/CSA-101/I.S.2/A440.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall Corporation; E-Series Fixed Large Missile Windows or comparable product.
2. Frame: Tubular extruded aluminum Alloy 6063-T5 with a polyamide-thermal-strut thermal break.
3. Construction: Frame sections mitered and joined by heavy aluminum internal corner gussets, mechanically staked and epoxy sealed. Joints exposed to weather sealed with an elastic compound. Openings double-sealed using continuous-EPDM bulb, foam, and wedge weather stripping.

    a. Operating sash of hollow extruded design, mitered and joined with reinforced corners.
    b. Inside glazed system with exterior expanded EPDM closed-cell sponge gaskets and interior snap-in aluminum glazing bead with driven EPDM wedge gaskets.

4. Glazing: 1-inch (25-mm) See Section 088000 "Glazing".
5. Properties:

    a. Design Pressure: 80 lbf/sq. ft. (3.83 kPa); passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996.

        1) Large-Missile Test: For glazing located within 30 ft. (9.1 m) of grade.

6. Finish: Coordinate with closure system.

2.6 FABRICATION

A. Sheet Fabrication:

1. Tolerances: Sheets manufactured to plus or minus 10 percent of thickness.

B. Frame System Fabrication:

1. Fabricate components that, when assembled fully welded, have the following characteristics:

    a. Profiles that are sharp, straight, and free of defects or deformations.
    b. Accurately fitted joints with ends coped or mitered.
    c. Internal guttering systems or other means to drain water passing through joints, and moisture migrating within assembly to exterior.

2. Fabricate sill closures with weep holes and for installation as continuous component.
3. Reinforce components as required to receive fastener threads.

C. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.

a. White spots indicating lack of bond at intersections of grid-core members are limited in number to four for every 40 sq. ft. (3.7 sq. m) of panel and limited in diameter to 3/64 inch (1.2 mm).

2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

2.7 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two coat fluoropolymer finish complying with the performance requirements of 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 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's fabrication drawings and written instructions.

1. Do not install damaged components.
2. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
3. Rigidly secure nonmovement joints.
4. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
5. Seal joints watertight unless otherwise indicated.

B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install components plumb and true in alignment with established lines and elevations.

D. Skylight Assemblies: Install continuous aluminum sill closures with weatherproof expansion joints and locked and sealed corners. Locate weep holes at rafters. Install components to drain water passing through joints and moisture migrating within assembly to exterior.

E. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:

1. Alignment: Limit offset from true alignment to 1/32 inch (0.8 mm) where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches (76 mm); otherwise, limit offset to 1/8 inch (3.2 mm).
2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 ft. (3.2 mm in 3.7 m), but no greater than 1/2 inch (13 mm) over total length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Water-Spray Test: Before installation of interior finishes has begun, panel assemblies to be tested in accordance with AAMA 501.2 and will not indicate evidence of water penetration.
2. Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas to be tested in accordance with ASTM E1105.

a. Test Procedures: Test under uniform and cyclic static-air pressure.
b. Static-Air-Pressure Difference: <**Insert pressure**>.
c. Water Penetration: None.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.4 CLEANING

A. Clean interior and exterior of fiberglass-sandwich-panel assembly immediately after installation in accordance with manufacturer's written instructions.

END OF SECTION 084523

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.

B. Hardware for fire-rated doors.

C. Lock cylinders for doors with balance of hardware specified in other sections.

D. Thresholds.

E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 081116 - Aluminum Doors and Frames.

C. Section 081213 - Hollow Metal Frames.

D. Section 081416 - Flush Wood Doors.

E. Section 081433 - Stile and Rail Wood Doors.

F. Section 083323 - Overhead Coiling Doors: Door hardware, except cylinders.

G. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

C. BHMA A156.1 - Standard for Butts and Hinges; 2021.

D. BHMA A156.3 - Exit Devices; 2020.

E. BHMA A156.4 - Door Controls - Closers; 2019.

F. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

G. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

H. BHMA A156.7 - Template Hinge Dimensions; 2016.

I. BHMA A156.16 - Auxiliary Hardware; 2018.

J. BHMA A156.18 - Materials and Finishes; 2020.

K. BHMA A156.21 - Thresholds; 2019.

L. BHMA A156.22 - Standard for Gasketing; 2021.

M. BHMA A156.26 - Standard for Continuous Hinges; 2021.

N. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2018.

O. BHMA A156.36 - Auxiliary Locks; 2020.

P. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

Q. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

R. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

S. DHI (KSN) - Keying Systems and Nomenclature; 2019.

T. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

U. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.

V. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

W. ITS (DIR) - Directory of Listed Products; Current Edition.

X. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

Y. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

AA. UL (DIR) - Online Certifications Directory; Current Edition.

BB. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

CC. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Requested:
      a. Contractor.
      b. Owner.
      c. Architect.
      d. Installer's Architectural Hardware Consultant (AHC).
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.

c. Verify that keying and programming complies with project requirements.
d. Establish keying submittal schedule and update requirements.

4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
a. Submit in vertical format.
3. Include complete description for each door listed.
4. Include manufacturers and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
2. Submit one (1) sample of lockset illustrating style, color, and finish.
3. Include product description with samples.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

K. Keying Schedule:

1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
1. Closers: 35 Years, minimum.
2. Exit Devices: Three years, minimum.
3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.
1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.
2. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
3. Strikes:
a. Finish: To match lock or latch.

b. Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
c. Center Strike At Pairs of Doors: 7/8 inch (22.2 mm) lip.

D. Door Pulls and Push Plates:
1. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.

E. Closers:
1. Provide door closer on each exterior door, unless otherwise indicated.
2. Provide door closer on each fire-rated and smoke-rated door.
3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

F. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.

G. Thresholds:
1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.

H. Weatherstripping and Gasketing:
1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

I. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
a. Aluminum fasteners are not permitted.
b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or _____ as suitable for application indicated.

5. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
7. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
8. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
   1. BEST; dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
   1. Butt Hinges: As applicable to each item specified.
      a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
      b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
      c. Template screw hole locations.
      d. Bearing assembly installed after plating.
      e. Bearings: Exposed fully hardened bearings.
      f. Bearing Shells: Shapes consistent with barrels.
      g. Pins: Easily seated, non-rising pins.
         1) Fully plate hinge pins.
         2) Non-Removable Pins: Slotted stainless steel screws.
      h. UL 10C listed for fire-resistance-rated doors.
   2. Continuous Hinges: As applicable to each item specified.

C. Sizes: See Door Hardware Schedule.
   1. Hinge Widths: As required to clear surrounding trim.
   2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
   1. Fully polish hinges, front, back, and barrel.

E. Grades:
   1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:
   1. Butt Hinges: Include full mortise hinges.
   2. Continuous Hinges: Include geared hinges.

H. Options: As applicable to each item specified.

I. Quantities:
   1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
      a. Hinge weight and size unless otherwise indicated in hardware sets:

1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.

2. Continuous Hinges: One per door leaf.

J. Applications: At swinging doors.
1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

K. Products:
1. Butt Hinges:
a. Ball Bearing, Five (5) Knuckle.
2. Continuous Hinges:
a. Aluminum geared hinges.

2.04 BOLTS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. Properties:
1. Flush Bolts:
a. Manual Flush Bolts: Manually latching upon closing of door leaf.
1) Bolt Throw: 3/4 inch (19 mm), minimum.
2. Dustproof Strikes: For bolting into floor, provide except at metal thresholds.

C. Options:
1. Extension Bolts: In leading edge of door, one bolt into floor, one bolt into top of frame.

D. Products:
1. Manual flush bolts.

2.05 EXIT DEVICES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
1. Actuation: Full-length touchpad.
2. Chassis:
a. Construction: Investment cast steel, zinc dichromate plated.
b. Compatibility: Standard Stile and Narrow Stile doors.
3. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.

4. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
5. Lever Design: Match project standard lockset trims.
6. Cylinder: Include where cylinder dogging or locking trim is indicated.
7. Strike as recommended by manufacturer for application indicated.
8. Sound dampening on touch bar.
9. Dogging:
   a. Non-Fire-Resistance-Rated Devices: Hex key 1/4 inch (6 mm) hex key dogging.
   b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
10. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.
11. All exposed exit device components to be of architectural metals and “true” architectural finishes.
12. Handing: Field-reversible.
13. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
14. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

C. Grades: Complying with BHMA A156.3, Grade 1.
   1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

D. Options:

E. Products:
   1. 2000.

2.06 REMOVABLE MULLIONS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
   1. Rectangular shape 3 inches (76 mm) by 2 inches (51 mm) tubes with minimum 1/8 inch (3.2 mm) wall thickness.
   2. Furnished by the same manufacturer as exit devices.
   3. Pre-drilled holes for installation of exit device strikes.
   4. Spacers: Provide as required for proper installation, based on frame profile and dimensions.

C. Grades: Complying with BHMA A156.3.

D. Materials: Manufacturer's standard for items specified.
   1. Top and Bottom Brackets: Investment-cast steel.

E. Options:
   1. Furnish Keyed Removable “KR” feature and corresponding cylinders as specified.
      a. Mullions capable of being installed without physical key present.
      b. Physical key required to operate.

F. Applications: As indicated on drawings and in Door Hardware Schedule.

G. Products:
   1. 822 Series.

2.07 LOCK CYLINDERS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
   1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
      a. Provide cylinders from same manufacturer as locking device.
      b. Provide cams and/or tailpieces as required for locking devices.
      c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
   1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:
   1. Manufacturer's standard corrosion-resistant brass alloy.

E. Types: As applicable to each item specified.
   1. Standard security small format interchangeable core (SFIC) type cylinders, with six-pin, 6C cores.

F. Applications: At locations indicated in hardware sets, and as follows
   1. As required for items with locking devices provided by other sections, including at elevator controls and cabinets.
      a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products:
   1. Rim/mortise.

2.08 MORTISE LOCKS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
   1. Mechanical Locks: Manufacturer's standard.
      a. Fitting modified ANSI A115.1 door preparation.
      b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
      c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
         1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
      d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
      e. Backset: 2-3/4 inch (70 mm).
      f. Lever Trim:
         1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
         2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
         3) Spindle: Designed to prevent forced entry from attacking of lever.
         4) Independent spring mechanism for each lever.
            (a) Trim to be self-aligning and thru-bolted.

5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
6) Levers to operate a roller bearing spindle hub mechanism.

2. Electrified Locks: Same properties as standard locks, and as follows:
   a. Voltage: 12 VDC.
   b. Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.

C. Finishes: See Door Hardware Schedule.
   1. Core Faces: Match finish of lockset.

D. Grades:

E. Options:
   1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.

F. Products: Mortise locks, including standard and electrified types.
   1. 40H.

2.09 AUXILIARY LOCKS (DEADLOCKS)

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
   1. Backset: 2-3/4 inch (70 mm), unless otherwise indicated.
   2. Strike: Appropriate for door frame.
   3. Cylindrical Deadbolt: Manufacturer's standard, adjustable to accommodate range of door thicknesses indicated.
      a. Door Thickness Fit: 1-3/8 inches (35 mm) to 3 inches (76 mm) thick doors.
      b. Bolt Throw: 1 inch (25.4 mm) hardened steel.
      c. UL listed for up to 3 hours.

C. Grades:
   1. Cylindrical Deadbolts: Tested and approved by BHMA A156.36, Operational Grade 1.

D. Products:
   1. 82/83T (Cylindrical, Grade 1).

2.10 NARROW STILE DEADLATCHES

A. Manufacturers:
   1. Accurate Lock and Hardware Co., LLC; www.accuratelockandhardware.com/#sle.
   2. Adams Rite.

B. Properties:
   1. Door Thickness Fit: 1-3/8 inch (35 mm) to 2-1/4 inch (57 mm) thick doors.
   2. Cases:
      a. Material: Steel with corrosion-resistant plating.
      b. Depth: Varies, commensurate with backset dimension.
   3. Backset: 7.8 inch (22.2 mm), unless otherwise noted.
   4. Latch: Single piece tail-piece construction.
   5. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
   6. Cylinders: Provide mortise cylinders.

7. Faceplates:: Manufacturer's standard for lock selected and door edge condition.
8. Trim: See Door Hardware Schedule.

C. Products:
1. MS1850S.

2.11 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. Properties:
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
a. Edges: Beveled, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

E. Products:
1. Push-Pull Plates.

2.12 CLOSERS

A. Manufacturers:
1. BEST, dormakaba Group www.bestaccess.com/#sle.
2. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.

B. Properties:
1. Surface Mounted Closers: Manufacturer's standard.
a. Construction: R14 high silicon aluminum alloy.
b. Hydraulic Fluid: All-weather type.
c. Arm Assembly: Standard for product specified.
1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
2) Parallel arm to be a heavy-duty rigid arm.
3) Where “IS” or “S-IS” arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
d. Covers:
1) Type: Standard for product selected.
2) Material: Plastic.
3) Finish: Painted.

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
(a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Types:
1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

E. Options:

1. Delayed action, adjustable with an independent valve.

F. Installation:
1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At outswinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

G. Products:
1. Surface Mounted:
a. EHD9000

2.13 PROTECTION PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
1) Size: 10 inches (254 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.
b. Mop Plates: Provide along bottom edge of push side of doors to provide protection from cleaning liquids and equipment damage to door surface.
1) Size: 6 inch (152 mm) high by 1-1/2 inch (38 mm) less door width (LDW) on pull side and 2 inch (51 mm) LDW on push side of door.
c. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.
a. Metal, Standard Duty: Thickness 0.050 inch (1.27 mm), minimum.

E. Installation:
1. Fasteners: Countersunk screw fasteners

F. Products:
1. K0050.

2.14 STOPS AND HOLDERS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Grades:
1. Wall Bumpers and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

D. Material: Base metal as indicated for each item by BHMA material and finish designation.

E. Types:
   1. Wall Bumpers: Bumper, concave, wall stop.
   2. Floor Stops: Provide with bumper floor stop.

F. Installation:
   1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

G. Products:
   1. Wall Bumpers.
   2. Floor Stops.

2.15 THRESHOLDS

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.

B. Properties:
   1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.
   1. Saddle Thresholds: Without thermal break.

E. Products:
   1. 425, 895 .

2.16 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.

B. Properties:
   1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft (_____ l/sq m) of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft (_____ l/sq m) of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

C. Grades: Comply with BHMA A156.22.

D. Products:
   1. Weatherstripping: See Door Hardware Schedule.
   2. Meeting Stile Seals: See Door Hardware Schedule.
   3. Door Bottom Seals:
      a. Door Sweeps: See Door Hardware Schedule.

2.17 MISCELLANEOUS ITEMS

A. Manufacturers:
   1. Trimco: www.trimcohardware.com/#sle.

B. Properties:
   1. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
      a. Single Door: Provide three on strike jamb of frame.

b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
c. Material: Rubber, gray color.

C. Products:
1. Silencers.

2.18 KEYS AND CORES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties: Complying with guidelines of BHMA A156.28.
1. Provide small format interchangeable core.
2. Provide Patented CORMAX keys and cores.
3. Provide keying information in compliance with DHI (KSN) standards.
4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
5. Keying: Master keyed.
6. Include construction keying and control keying with removable core cylinders.
7. Supply keys in following quantities:
a. Master Keys: 4 each.
b. Construction Master Keys: 6 each.
c. Construction Keys: 15 each.
d. Construction Control Keys: 2 each.
e. Control Keys if New System: 2 each.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
1. Patented:
a. CORMAX.

2.19 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
1. Finish: 630; satin stainless steel, with stainless steel 3000 series base material (former US equivalent 32D), 652; satin chromium plated over nickel, with steel base material (former US equivalent 26D), and 689; aluminum painted, with any base material (former US equivalent US28); BHMA A156.18.

B. Exceptions:
1. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
2. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list, unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Steel Doors and Frames: See Section 6549.
   3. For Steel Door Frames: See Section 081213.
   4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
   5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
   6. Flush Wood Doors: See Section 081416.
   7. Stile and Rail Wood Doors: See Section 081433.
   8. Mounting heights in compliance with ADA Standards:
      a. Locksets: 40-5/16 inch (1024 mm).
      b. Push Plates/Pull Bars: 42 inch (1067 mm).
      c. Deadlocks (Deadbolts): 48 inch (1219 mm).
      d. Exit Devices: 40-5/16 inch (1024 mm).
      e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal, anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

Manufacturer list

A-R	Adams Rite
BES	Best
BES	BEST
PRE	BEST (Precision)
NGP	National Guard Products
TRI	Trimco

Option list

Code:	Name:
S300	Standard strike
3	2-3/4" Backset
SIS90	SIS90 HD regTJ comp
S2	Standard Spindle
7	7 Pin
0	0>Non-Keyed
SDS90	SDS90 HD comp
SPA90	SPA90 HD
B4E	Beveled 4 edges
AVB	AVB Advanced Variable Backchk
B4E	Bevel 4 edges
CHB	Entrance Holdback Function
VIB	Double Visual Indicator
PATD	Patented keyed core
T	Dormitory Function
AF90P	AF90P Stard flat m tri-pack
CS	Concealed Screws
4903	Key retracts latchbolt

4" ODW	4" Over Door Width
WV	Wrought Wall Bumper Concave Combo Pack
PATD	Patented
3B	Pull Plate 4" x 16" with 10" CTC Pull
LAR	Length As Required
RP	Rim Cylinder Ring
410	1-1/2" - Backset Straight Bolt – Non Handed
NRP	NRP>NON-REMOVABLE PINS
CSK	Counter Sunk Holes

Finish list

Code:	Name:
600	600>Primer
689	689 Aluminum
626	Satin Chrome plated over nickel
A	Anodized Aluminum
26D	26D>CHROMIUM PLATED SATIN
US27	Mill Finish
628	Clear Anodized
Gray	Gray Rubber
630	Satin stainless steel
630	Satin Stainless Steel
AL	AL>ALUM CLEAR COATED
626	Satin chromium plated

Specification Report

Set #1

Doors: 101A, 100B, 100C

1	Hardware	By Door Mfg.		

NOTE: OH door

Set #2

Doors: 101B, 102

6	Hinge	FBB168 NRP 4.5 X 4.5	26D	BES
2	Flush Bolt	3917 12	626	TRI
1	Mortise Lock	45H 7 D 14 H PATD	626	BES
1	Strike	3910	630	TRI
2	Door Closer	EHD9016 SPA90	689	BES
2	Kick Plate	K0050 10" X 1.5" LDW CSK B4E	630	TRI
1	Astragal	By Hollow Metal Dr. Mfg.		
2	Silencer	1229A	Gray	TRI

Set #3

Doors: 104, 226A, 214B.1, 213B.1

3	Hinge	FBB168 NRP 4.5 X 4.5	26D	BES
1	Mortise Lock	45H 7 D 14 H PATD	626	BES
1	Door Closer	EHD9016 SPA90	689	BES
1	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1	Wall Stop	1270 WV	630	TRI
2	Silencer	1229A	Gray	TRI

Set #4

Doors: 105, 106, 215, 218

3	Hinge	FBB168 4.5 X 4.5	26D	BES
1	Deadbolt	8T 3 S CS PATD 7	626	BES
1	Push Plate	1001 3	630	TRI
1	Pull Plate	1018 3B	630	TRI
1	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1	Mop Plate	KM050 6" X 1" LDW CSK B4E	630	TRI
1	Wall Stop	1270 WV	630	TRI
3	Silencer	1229A	Gray	TRI

Set #5

Doors: 100A, 100E, 100F, 100D, 201G, 223A, 212, 221A, 213A, 214A

2	Hinge	661HDUL 83IN	AL	BES
1	Mullion	RM 822	600	PRE
2	Exit Device	2103 4903 D S300	630	PRE

3	Rim Cylinder	12E 7 2 PATD S2 RP	626	BES
2	Door Closer	EHD9016 SDS90	689	BES
1	Threshold	896 S LAR (1/4-20 SS MS/EA)	US27	NGP
1	Weatherstrip	By Alum Frame Mfg.		
1	Meeting Style Seal	By Alum Door Mfg.		
2	Sweep	C627 LAR	A	NGP
1	Drip Cap	16 4" ODW	A	NGP

Set #6

Doors: 201A, 201B, 201C, 201D

6	Hinge	FBB168 NRP 4.5 X 4.5	26D	BES
1	Mullion	RM 822	600	PRE
2	Exit Device	2108 4908 D S300	630	PRE
3	Rim Cylinder	12E 7 2 PATD S2 RP	626	BES
2	Door Closer	EHD9016 SDS90	689	BES
1	Threshold	425 LAR (1/4-20 SS MS/EA)	US27	NGP
1	Weatherstrip	By Alum Frame Mfg.		
1	Meeting Style Seal	By Alum Door Mfg.		

Set #7

Doors: 201F, 201H

2	Hinge	661HDUL 83IN	AL	BES
2	Push / Pull Bar	1737 CTC dimension as directed by Architect	630	TRI
2	Door Closer	EHD9016 SDS90	689	BES
1	Weatherstrip	By Alum Frame Mfg.		
1	Meeting Style Seal	By Alum Door Mfg.		

Set #8

Doors: 225, 224, 210, 219

3	Hinge	FBB168 4.5 X 4.5	26D	BES
1	Mortise Lock	45H 7 D 14 H PATD	626	BES
1	Door Closer	EHD9016 AF90P	689	BES
1	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1	Wall Stop	1270 WV	630	TRI
2	Silencer	1229A	Gray	TRI

Set #9

Doors: 220, 209

3	Hinge	FBB168 4.5 X 4.5	26D	BES
1	Mortise Lock	45H 0 L 14 H VIB	626	BES
1	Door Closer	EHD9016 AF90P	689	BES
1	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1	Mop Plate	KM050 6" X 1" LDW CSK B4E	630	TRI
1	Wall Stop	1270 WV	630	TRI

2	Silencer	1229A	Gray	TRI

Set #10
Doors: 203, 204, 205, 206, 207

3	Hinge	FBB179 4.5 X 4.5	26D	BES
1	Mortise Lock	45H 7 AB 14 H PATD	626	BES
1	Wall Stop	1270 WV	630	TRI
3	Silencer	1229A	Gray	TRI

Set #11
Doors: 216, 217

1	Hinge	661HDUL 83IN	AL	BES
1	Mortise Lock	45H 7 T 14 H PATD VIB	626	BES
1	Door Closer	EHD9016 SDS90	689	BES
1	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1	Gasketing	160S Head & Jambs (2)	A	NGP
1	Sweep	200N LAR	A	NGP
1	Threshold	425 LAR (1/4-20 SS MS/EA)	US27	NGP

Set #12
Doors: 202

3	Hinge	FBB168 4.5 X 4.5	26D	BES
1	Mortise Lock	45H 7 CHB 14 H PATD	626	BES
1	Door Closer	EHD9016 AF90P	689	BES
1	Kick Plate	K0050 10" X 2" LDW CSK B4E	630	TRI
1	Wall Stop	1270 WV	630	TRI
2	Silencer	1229A	Gray	TRI

Set #13
Doors: 213B, 214B

6	Hinge	FBB168 NRP 4.5 X 4.5	26D	BES
2	Flush Bolt	3917 12	626	TRI
1	Deadlock	MS1850S 410	628	A-R
1	Thumbturn	4066 01	628	A-R
1	Strike	3910	630	TRI
2	Push / Pull Bar	1737 CTC dimension as directed by Architect	630	TRI
2	Door Closer	EHD9016 SDS90	689	BES
1	Weatherstrip	By Alum Frame Mfg.		
1	Meeting Style Seal	By Alum Door Mfg.		

Set #14
Doors: 221B

6	Hinge	FBB168 NRP 4.5 X 4.5	26D	BES

2	Flush Bolt	3917 12	626	TRI
1	Deadlock	MS1850S 410	628	A-R
1	Thumbturn	4066 01	628	A-R
1	Strike	3910	630	TRI
2	Push / Pull Bar	1737 CTC dimension as directed by Architect	630	TRI
2	Door Closer	EHD9016 SIS90	689	BES
1	Weatherstrip	By Alum Frame Mfg.		
1	Meeting Style Seal	By Alum Door Mfg.		

OPENING LIST

OPENING:	HARDWARE SET ASSIGNMENT:
101A	1 -
101B	2 -
102	2 -
104	3 -
105	4 -
106	4 -
100B	1 -
100C	1 -
100A	5 -
100E	5 -
100F	5 -
100D	5 -
201A	6 -
201B	6 -
201C	6 -
201D	6 -
201G	5 -
223A	5 -
201F	7 -
201H	7 -
226A	3 -
225	8 -
224	8 -
210	8 -
219	8 -
214B.1	3 -
213B.1	3 -
215	4 -
218	4 -
220	9 -
209	9 -
203	10 -
204	10 -
205	10 -
206	10 -
207	10 -
212	5 -

221A 5 -
213A 5 -
214A 5 -
216 11 -
217 11 -
202 12 -
213B 13 -
214B 13 -
221B 14 -

END OF SECTION

SECTION 088000

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes:
   1. Glazing for installation to the following:
      a. Aluminum storefronts systems including entrances.
      b. Aluminum curtain wall systems including entrances.
      c. Hollow metal doors and frames.
      d. Wood doors.
   2. Glazing accessories.

B. Extent of glass and glazing work is indicated on drawings and schedules.

C. Related Sections:
   1. Division 7 Section – "Joint Sealants."
   2. Division 8 Section – "Hollow Metal Doors and Frames."
   3. Division 8 Section – "Flush Wood Doors."
   4. Division 8 Section – "Aluminum-Framed Entrances and Storefronts."

1.3 DESIGN AND PERFORMANCE REQUIREMENTS:

A. Wind Loads: Comply with wind load design requirements specified in Division 8 Section "Aluminum-Framed Entrances and Storefronts."

B. Thermal Insulating Units: Units shall comply with the requirements of ASTM E2190-08 and certified by Insulating Glass Certification Council (IGCC) or Associated Laboratories, Inc. (ALI).

C. Tinted, Low-E, Thermal Insulating Glass Performance Characteristics: Values indicated based on *PPG Solarban 60 on Solargray;* 1-inch thickness insulated unit with 1/4-inch thickness lites; coating applied to #2 surface.
   1. Thermal Transmittance ("U" value winter night): 0.29.
   2. Solar Heat Gain Coefficient(SHGC): 0.25.
   3. Visible Light Transmittance: 35-percent.

D. Tempered Glazing Materials: Complying with CPSC 16-CFR, Part 1201, Category II.

E. Heat Treatment: Glazing materials, whether in monolithic state or as a lite of a thermal insulating unit, shall be heat treated where required by glass manufacturer's design calculations to resist stress caused by glass orientations, sizes and configurations, heat stress, inherent imperfections, wind loading, glazing conditions, temperature differential, inside window treatments or other conditions affecting breakage probability. Maximum allowable breakage probability at design loads shall be eight (8) lites per thousand for vertical glazing.

F. Glazing Orientation for Heat-Treated Glass: Orient lites with roll distortion parallel to head and sill members.

1.4 SUBMITTALS:

A. Product Data:

1. Submit for each type glazing material and accessory product specified; indicating performance characteristics.
2. Include technical data and instructions for storage and handling procedures.

B. Framing Manufacturer's Approval: Indicate by letter prior to submission of shop drawings for storefront system that an authorized representative of selected storefront manufacturer has reviewed and approved details, including glass bite, clearances and glazing methods.

C. Samples: Submit minimum 12-inch (1'-0") by 12-inch (1'-0") samples of each type of glazing material proposed for use, if requested by Architect.

D. Glass Design Calculations: Submit calculations prepared by glazing material manufacturer indicating recommendations for glass thickness and heat treating of glazing materials as a result of heat stress, building orientation, inside window treatments, shading by exterior building elements or wind loading.

1. Identify factors affecting breakage probability which have been taken into consideration and anticipated by calculations.
2. Calculations are submitted for Architect's information only.

E. Maintenance Data: Include glazing material manufacturer's maintenance data for cleaning and care of each type of glazing material. Submit as part of contract closeout documents.

1.5 QUALITY ASSURANCE:

A. Single Source Requirements: Tinted and low emissivity (Low-E) glass types, whether used in a monolithic state or as a lite of a thermal insulating unit, shall each be the products of a single manufacturer.

B. Labels:

1. Glazing shall bear manufacturer's label identifying type, quality and thickness of material. Labels for single thickness annealed float glass, if not available on each lite shall at least be factory applied to shipping crates. All other glazing materials shall be required to bear labels on each lite either temporary or permanent types as required by governing building codes or certification agency where specified.

2. Tempered glass shall have permanent etched or ceramic fired identification on each unit indicating compliance with safety glazing standard. Identification shall be visible in completed installation and oriented in an inconspicuous corner.

1.6 PRE-GLAZING CONFERENCE:

A. Prior to beginning glass and glazing work, a pre-glazing conference will be held to review work to be accomplished.

B. Contractor, storefront and fire-rated storefront supplier and erector, a representative of glass manufacturer, including fire-rated glass manufacturer, a representative of sealant manufacturer, glazing subcontractor and Architect will be present.

C. Contractor shall notify Architect at least three days prior to time of conference.

D. Material submitted by Contractor, interfacing of glass and glazing and storefront work, dimensions and tolerances, sealant joint widths and depths will be reviewed.

1.7 DELIVERY, STORAGE AND HANDLING:

A. Deliver glazing materials with manufacturer's identification, glass type, thickness and quality labeled on each piece. Remove no labels until final cleaning.

B. Store glazing materials indoors in cool, dry area, off floor, equally supported to prevent stress and breakage.

C. Do not move cases which have been partially unpacked. Unpack glazing materials in accordance with manufacturer's product data for type of material being handled. Stack individual lites as recommended by manufacturer's product data.

D. Utilize rolling blocks to rotate glazing materials.

E. Handle insulating units without rotating, warping or "cartwheeling" units. Prevent damage to glazing material or edge seal.

1.8 WARRANTIES:

A. Thermal Insulating Units: Warrant from failure due to loss of edge seal for a period of Ten (10) Years, beginning at Date of Substantial Completion.

B. Low Emissivity (Low-E) Glass: Low emissivity coating shall be warranted against peeling, cracking, discoloration or deterioration for a period of Ten (10) Years, beginning at Date of Substantial Completion.

C. Glass Replacement Warranty: Provide warranty covering replacement of damaged glazing materials for any reason other than natural disasters, vandalism or damage resulting from accident or abuse arising out of the Owner's operations for a period of Two (2) Years, beginning at Date of Substantial Completion. Warranty shall include labor and material costs for replacement of glazing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Float Glass Manufacturers; subject to compliance with specified requirements:
1. AGC Glass Company North America, Inc.
2. Guardian Industries Corp.
3. Pilkington NA / Nippon Sheet Glass Company Ltd.
4. PPG lndustries, Inc.
5. Viracon, Inc.

B. Acceptable Coated Glass Manufacturers; subject to compliance with specified requirements:
1. AGC Glass Company North America, Inc.
2. Cardinal Glass Industries, Inc.
3. Guardian Industries Corp.
4. Pilkington NA / Nippon Sheet Glass Company Ltd.
5. PPG Industries, Inc.
6. Viracon, Inc.

C. Acceptable Insulating Glass Unit Fabricators; subject to compliance with specified requirements:
1. AGC Glass Company North America, Inc.
2. Cardinal Glass Industries, Inc.
3. Guardian Industries Corp.
4. Oldcastle BuildingEnvelope / Oldcastle, Inc.
5. Pilkington NA / Nippon Sheet Glass Company Ltd.
6. Viracon, Inc.

2.2 PRIMARY AND PROCESSED GLAZING MATERIALS:

A. Clear Float Glass: Meeting ASTM C1036, Type I, Class 1 (clear), Quality q3 (glazing select); minimum 1/4-inch thickness, or as determined by glazing manufacturer's analysis.

B. Heat-Strengthened Clear Float Glass: Meeting ASTM C 1048, Type I, (transparent), Class 1 (Clear), Quality q3 (Glazing Select), Kind HS (Heated Strengthened), Condition A (Uncoated Glass); thickness as specified or as determined by glazing manufacturer's analysis.

C. Tempered, Clear Float Glass: Meeting ASTM C 1048, Kind FT (fully tempered), Condition A, Type I, Class 1 (clear), Quality q^3 (glazing select); minimum 1/4-inch thickness, except as otherwise indicated.

D. Tinted, Low-E Float Glass:
1. Basis of Design: PPG Industries, Inc.; Solarban 60 on Solargray.
2. Material:: Low emissivity, pyrolytic-coated or sputter-coated, tinted, annealed, tempered or heat strengthened float glass meeting specified ASTM standards

indicated and as determined by glazing manufacturer's analysis for application required.

a. Heat Strengthen, Float Glass: Meeting ASTM C1048, Kind HS (heat strengthen), Condition C, Type I, Class 2 (tinted), Quality q3 (Glazing Select).

b. Tempered, Float Glass: Meeting ASTM C1048, Kind FT (fully tempered), Condition C, Type I, Class 2 (tinted), Quality q3 (Glazing Select).

3. Thickness: As determined by glazing manufacturer's analysis.

4. Color: Gray.

2.3 FABRICATED GLAZING UNITS:

A. Butt Joint Glazing Units: Tempered, clear float glass meeting ASTM C 1048, Kind FT (fully tempered), Condition A, Type I, Class 1 (clear), Quality q^3 (glazing select;), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Thickness: 3/8-inch.

2. Butt Edges: Flat ground to produce square edges with slight chamfers at junctions of edges and faces.

B. Tinted, Low-E, Thermal Insulating Units:

1. Basis of Design: PPG Industries, Inc.; Solarban 60 on Solargray + clear glass.

2. Outboard Lite: Tinted, low-E, heat strengthen, float glass as specified; thickness as determined by glazing manufacturer's analysis. Low-E coating applied to No. 2 surface.

3. Inboard Lite: Clear, heat strengthen float glass as specified; thickness as determined by glazing manufacturer's analysis.

4. Spacer: Manufacturer's standard steel or aluminum spacer with welded, fused or bent corners and welded or fused splices and joints, filled with desiccant; to provide a 1/2-inch thickness, hermetically sealed, dehydrated air space.

5. Unit Thickness: 1-inch, minimum.

C. Tempered, Tinted, Low-E, Thermal Insulating Units:

1. Basis of Design: PPG Industries, Inc.; Solarban 60 on Solargray + clear glass.

2. Outboard Lite: Tempered, tinted, low-E, float glass as specified; thickness as determined by glazing manufacturer's analysis. Low-E coating applied to No. 2 surface.

3. Inboard Lite: Tempered, clear float glass as specified; thickness as determined by glazing manufacturer's analysis.

4. Spacer: Manufacturer's standard steel or aluminum spacer with welded, fused or bent corners and welded or fused splices and joints, filled with desiccant; to provide a 1/2-inch thickness, hermetically sealed, dehydrated air space.

5. Unit Thickness: 1-inch, minimum.

D. Obscure, Tinted, Low-E, Thermal Insulating Units:

1. Basis of Design: PPG Industries, Inc.; Solarban 60 on Solargray + decorative obscure glass.
2. Outboard Lite: Tinted, low-E, heat strengthen, float glass as specified; thickness as determined by glazing manufacturer's analysis. Low-E coating applied to No. 2 surface.
3. Inboard Lite: Heat strengthen, decorative obscure glass as specified; thickness as determined by glazing manufacturer's analysis.
4. Spacer: Manufacturer's standard steel or aluminum spacer with welded, fused or bent corners and welded or fused splices and joints, filled with desiccant; to provide a 1/2-inch thickness, hermetically sealed, dehydrated air space.
5. Unit Thickness: 1-inch, minimum.

2.4 GLAZING ACCESSORIES:

A. Setting Blocks: Neoprene, 70-90 Shore A durometer hardness, meeting ASTM C 864.

B. Edge Blocks: Neoprene, 60-70 Shore A durometer hardness, meeting ASTM C 864.

C. Spacers: Neoprene, 40-60 Shore A durometer hardness, meeting ASTM C 864.

D. Glazing Gaskets for Storefront Systems: Glazing assembly manufacturer's standard extruded or molded neoprene or Ethylene Propylene Diene Monomer (EPDM) gaskets.

E. Interior Hollow Metal Partition Glazing: Manufacturer's standard resilient glazing beads.

F. Polyvinyl Chloride Foam Tape: Closed cell foam tape meeting ASTM D1667-05 with pressure-sensitive adhesive on one side.

G. Fire-Rated Glazing Accessories:
1. Glazing Gaskets and Tapes: Closed cell polyvinyl chloride (PVC) foam tape, EPDM tape, ceramic glazing tape or other flame resistant gasket material as recommended by fire-rated glazing manufacturer and fire tested with glazing assemblies for specified ratings.
2. Setting Blocks: Neoprene, EPDM, hardwood or calcium silicate setting blocks as recommended by fire-rated glazing manufacturer and fire tested with glazing assemblies for specified ratings.
3. Cleaners, Primers and Sealers: Types as recommended by glazing and gaskets manufacturer.

2.5 GLAZING SEALANT:

A. Acceptable Products; subject to compliance with specified requirements:
1. Dow Corning Corp.; 795 Silicone Building Sealant.
2. Pecora Corp.; 895NST.
3. Tremco, Inc.; Spectrum 2.

B. Characteristics: One part, neutral-curing silicone rubber glazing sealant complying with ASTM C920-05, Type S, Grade NS, Class 50, Use NT.

1. Joint Movement Capability: Minimum plus or minus 50-percent extension and compression.
2. Colors: As selected by Architect from manufacturer's standard full range color selection.

C. Accessories: Provide primers as required, backer rod and accessories acceptable to sealant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify compliance with the following requirements prior to beginning glazing work:
1. That framing is anchored in position, plumb and square within 1/8-inch of nominal dimensions indicated.
2. That fastener heads, and other projections are removed from glazing rabbets.
3. That corners and fabricated intersections are sealed and framing is weather-tight.
4. That rabbets at sills weep to outside and rabbets are of sufficient depth and width to receive glazing material and provide the required bite of the glazing material.
5. That wood frames have been prime painted or stained and finished as applicable in accordance with Painting section.
6. That hollow metal frames have received paint finish in accordance with Painting section.

3.2 PREPARATION:

A. Clean glass edges and framing glazing channel of debris and protective coatings immediately prior to glazing. Use material acceptable to framing, glazing material and glazing sealant manufacturers.

B. Inspect glazing material prior to installation. Eliminate lites having face or edge damage.

C. Lites of tempered, heat-strengthened, laminated and insulating glass shall not be cut or otherwise altered in the field.

3.3 INSTALLATION REQUIREMENTS:

A. Install glazing materials to obtain air-tight and water-tight installation and to withstand normal temperature changes and wind loads without failure.

B. Protect glazing material faces and edges during handling and installation.

C. Size glazing materials for each opening to ensure correct bite on glazing material, without imposing strain, in accordance with manufacturer's product data.

D. Maintain minimum 1/8-inch bed clearance between glazing material and sash, on both sides, except where greater clearances is required by either glazing material or framing manufacturer.

3.4 GLAZING INSTALLATION:

A. Install glazing materials in accordance with manufacturer's product data and applicable standards, except where more stringent requirements are specified.

B. Install setting blocks for all glazing materials over six sq. ft. in area.

1. Install at sill rabbet located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inch from corner, unless otherwise required.
2. Size setting blocks in proportion to glass weight; minimum 4-inch length.

C. Shim all lites over 100 united inches, inboard and outboard, on all sides using continuous shims, except where gaskets accomplish shimming; unless otherwise specified.

D. Provide edge blocks at vertical jambs to limit lateral movement of glass. Provide edge blocks in 4-inch minimum lengths. Maintain 1/8-inch clearance between edge of glass and edge block.

E. Storefront Glazing:

1. Install continuous gasket to exterior side of rabbet with joints located at center and top of frame. Notch gasket at corners to form neat joints.
2. Set glazing material centered in rabbet. Apply gaskets to interior side of rabbet, with corners mitered.
3. Oversize gaskets to allow compressing of miter joints to provide positive seal.

F. Interior Hollow Metal Partition Glazing: Glaze using specified glazing beads in accordance with manufacturer's instructions.

G. Glazing Sealant Installation: Comply with applicable provisions of Division 7 "Joint Sealants" section. Prevent filling of weep holes with sealant.

3.5 PROTECTION AND CLEANING:

A. For glazing materials subject to damage during construction, protect from breakage by attachment of crossed streamers to framing. Do not mark on surfaces.

B. Remove and replace broken, cracked, chipped or otherwise damaged glazing materials and materials not meeting specified design requirements prior to Date of Substantial Completion.

C. Final cleaning: Just prior to Date of Substantial Completion, clean glass inside and out.

1. Clean using pre-tested detergent and water. Flush with clean water.
2. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

END OF SECTOIN 088000

SECTION 09 3000
TILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Tile for shower receptors.

D. Ceramic trim.

E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

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

B. Section 07 9005 - Joint Sealers.

C. Section 09 2116 - Gypsum Board Assemblies: Description and installation of tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017 (Reaffirmed 2022).
   2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.
   3. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2021).
   4. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
   5. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2019.
   6. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2021.
   7. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
   8. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
   9. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
   10. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
   11. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
   12. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
   13. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
   14. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

15. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.
16. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives. Include test results where indicated.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on one plywood panel, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Samples: Submit two each 3 by 3 inch tile samples for color and product verification.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 2 percent of each size, color, and surface finish combinationbut not less than 10 square feet of each type.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

1.07 MOCK-UPS

A. Include Tiling in Mock-Up as described in Section 01 4000 - Quality Requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

PART 2 - PRODUCTS

2.01 TILE

A. Manufacturers:
1. See Drawings for manufacturers.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Porcelain Floor Tile
1. See Drawings for products.
2. Colors, Sizes, and Patterns: See Finish Plan and Finish Legend.

C. Porcelain Wall Tile
1. See Drawings for products.

2. Colors, Sizes, and Patterns: See Interior Elevations and Finish Legend.

D. Floor Tile Coefficient of Friction:
1. Minimum Slip Resistance: Dynamic Coefficient of Friction, per ANSI A137.1-2012, shall be 0.42 (per the DCOF AcuTest) for any tile used on walking surface.

2.02 TRIM AND ACCESSORIES

A. Porcelain/Ceramic Trim: Matching bullnose shapes in sizes coordinated with field tile.
1. Applications:
a. Open Edges: Bullnose.
b. Inside Corners: Jointed.
c. Floor to Wall Joints: Cove base, unless indicated otherwise.
2. Manufacturers: Same as for tile.

B. Non-Porcelain/Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
a. Open edges of wall tile.
b. Open edges of floor tile.
c. Wall corners, outside and inside.
d. Transition between floor finishes of different heights.
1) Schluter Reno, or as indicated on drawings.
e. Thresholds at door openings.
f. Expansion and control joints, floor and wall.
g. Floor to wall joints.
h. Borders and other trim as indicated on drawings.
2. Manufacturers:
a. Schluter-Systems: www.schluter.com/#sle.
b. Genesis APS International: www.genesis-aps.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ADHESIVE/BOND COAT MATERIALS

A. Manufacturers:
1. Bostik Inc: www.bostik-us.com.
2. Mapei Corporation: www.mapei.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Adhesive: Latex-Portland Cement Mortar Bond Coat, ANSI A118.4.

2.04 GROUTS

A. Manufacturers:
1. Bostik Inc: www.bostik-us.com.
2. Custom Building Products; _____: www.custombuildingproducts.com/#sle.
3. LATICRETE International, Inc; _____: www.laticrete.com/#sle.
4. Hydroment.
5. Mapei Corporation: www.mapei.com.
6. StarQuartz Industries, Inc.: www.StarQuartz.com.
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Grout: 100% solids epoxy grout as specified in ANSI A118.3 - most current standard.
1. Colors: To be selected by Architect from manufacturer's full range.
2. Locations: At all locations, unless noted otherwise.

2.05 SETTING-BED MATERIALS

A. Mortar Bed Materials: Portland cement, sand, latex additive, and water.

B. Waterproofing Membrane: Equivalent to "ECB Anti-Fracture Membrane", as manufactured by NAC Products, Inc.; Cuyahoga Falls, Ohio (Phone: 1-800-633-4622).
   1. Provide complete system, including substrate primer/sealer, 40-mil, two component, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.
   2. Locations for Use: Below all tile flooring, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.
   3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORY MATERIALS

A. Cleavage Membrane: No. 15 asphalt saturated felt; complies with ANSI 108.02-3.8.

B. Vapor Retarder Membrane at Walls: No. 15 (6.9kg) asphalt saturated felt. Complies with ANSI A108.02-3.8.

C. Waterproofing Membrane: Equivalent to "ECB Anti-Fracture Membrane", as manufactured by NAC Products, Inc.; Cuyahoga Falls, Ohio (Phone: 1-800-633-4622).
   1. Provide complete system, including substrate primer/sealer, 40-mil, two component, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.
   2. Locations for Use: Below all tile flooring, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.
   3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.

D. Substitutions: Section 01 6000 - Product Requirements.

E. Shower Membrane:
   1. OPTION 2: Waterproofing Membrane, and Floor Drain with Integrated Bonding Flange; Consisting of the following components (for use with thinsetting tile):
      a. Schluter KERDI: 0.008 inch (o.2mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which meets or exceeds the requirements of the "American National Standard Specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10", and is evaluated by ICC-ES (Report No. ESR-2467).
      b. Schluter KERDI-DRAIN (Plastic): Floor drain 11-3/16 inch (300mm) diameter, trapezoid-perforated, sloped integrated bonding flange with thermally laminated polypropylene fleece and grate assembly. Grate assembly includes grate, height adjustment collar, and lateral adjustment ring with trapezoid perforations. Drain listed by UPC to meet requirements of "International Association of Plumbing and Mechanical Officials Interim Guide Criteria for Floor Drain with Integrated Bonding Flange" (IGC 195), referenced in method B422 of TCNA Handbood for Ceramic Tile Installation.
      c. Schluter KERDI-SHOWER-SC: Trapezoid-imprinted, prefabricated, tiled shower curb base, made of 2.75 lb/cu ft (44 kg/cu. meter) density self-extinguishing (HF-1 rating per UL-94) expanded polystyrene. Curb dimensions: 48 inch x 6 inch x 4-1/2 inch.

F. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

G. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape, complies with ASTM C475.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings. Align joints of wall base and wall tile with those in floor tile.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Use manufacturer's recommended grout joint width. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

L. Grout tile joints. Use standard grout unless otherwise indicated.Use epoxy grout unless otherwise indicated.

M. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

N. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F131, epoxy bond coat and grout, unless otherwise indicated.
   1. Use waterproofing membrane under all tile.
   2. Where waterproofing membrane is indicated, install as recommended by manufacturer, and in accordance with applicable TCA Handbook Method.

B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with grout as indicated in finish schedule on Drawings.

B. Over interior concrete substrates, install in accordance with TCNA (HB) Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCNA (HB) Method F121.

2. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F132, bonded.
3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCNA (HB) Method F114, with cleavage membrane.

C. Cleavage Membrane: Lap edges and ends.

D. Mortar Bed Thickness: 5/8 inch, unless otherwise indicated.

3.06 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. At bathtub walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane.

C. Grout with standard grout as specified above.

3.07 INSTALLATION - WALL TILE

A. Over interior cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244C, using waterproof membrane, and epoxy grout.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

C. Over interior concrete and masonry install in accordance with The Tile Council of North America Handbook Method W202 thin-set with epoxy bond coat and grout.

3.08 INSTALLATION - SHOWER PANS

A. Over backer board walls and mortar bed floor, install shower receptor in accordance with The Tile Council of North America Handbook Method TR420. Test shower pans.

3.09 CLEANING

A. Clean tile and grout surfaces.

3.10 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.11 SCHEDULE

A. See Finish Schedule on Drawings.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

D. Perimeter trim.

1.02 RELATED REQUIREMENTS

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

B. Section 07 2100 - Thermal Insulation: Acoustical insulation.

C. Section 07 9200 - Joint Sealers: Acoustic sealant.

D. Section 09 2116 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

E. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

G. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

K. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.

L. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

M. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum; 2021a.

N. ITS (DIR) - Directory of Listed Products; Current Edition.

O. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

P. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 8 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 MAINTENANCE MATERIALS

A. Furnish the following for Owner's use in maintenance of project.

B. See Section 01 6000 - Product Requirements, for additional provisions.

C. Extra Acoustical Units: 200 sq ft of each type and size.

1.07 QUALITY ASSURANCE

A. Single Source Responsibility: Provide acoustical panel units and grid components from the same manufacturer.

B. Fire Resistive Assemblies: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
2. Surface Bunring Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
3. Fire Resistance: As follows, tested per ASTM E 119 and listed in the appropriate floor or roof design in the Underwriters Laboratory Fire Resistance Directory.

C. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

E. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to, building insulation, gypsum board, lighting, HVAC, electrical, and sprinkler systems.

1.08 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

B. Do not install acoustical units in spaces that are unconditioned, where wet work is ongoing, or where the state of completion is essentially suitable for occupancy.

1.09 WARRANTY

A. Acoustical Panels: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failure includes, but is not limited to:

1. Acoustical Panels: Sagging or warping.
2. Grid System: Rusting or manufacturer's defects.

B. Warranty Period: Thirty (30) years from the date of Substantial Completion.

C. The Warranty shall not deprive the Owner of other rights it may have under other provisions of the Contract and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site in original packaging and store indoors in a cool dry environment in strict accordance with the manufacturers printed instructions.

B. Protect materials from damage due to exposure to exterior environments including rain and sunlight, construction activities, and related conditions.

C. Prior to installing acoustical units, allow them to acclimate to the interior environment for a minimum of twenty-four hours.

D. Handle acoustical units carefully to avoid damage from installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Basis of Design: Armstrong World Industries, Inc: www.armstrongceilings.com.
   2. Other Acceptable Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls.
      b. USG Corporation: www.usg.com/ceilings.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Basis of Design: Armstrong World Industries, Inc: www.armstrongceilings.com.
   2. Other Acceptable Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls.
      b. USG Corporation: www.usg.com/ceilings.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. See Finish Schedule for products.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

E. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

K. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

I. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

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SECTION 09 6466
WOOD ATHLETIC-FLOORING ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. A. This Section includes:
   1. New maple, strip flooring system on subfloor, and related work. Floating resilient wood athletic floor system
   2. New striping and graphics, as indicated on Drawings and herein.

1.02 DESCRIPTION

A. Related work specified under other sections.
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   2. Allowances - Section 01 2100: Allowances affecting striping and graphics work of this Section.
   3. Concrete and Concrete Finishing - Section 03 3100.
      a. Concrete Slab Depression: 1-3/4” using 25/32” flooring and subfloor for SB System.
      b. Surface Finish: steel troweled and finished smooth.
      c. Concrete Tolerance: 1/8” in radius of 10’.
      d. Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
   4. Membrane Waterproofing and Dampproofing
      a. Concrete subfloors on or below grade shall be adequately waterproofed beneath the slab and at the perimeter walls and on the earth side of below grade walls by general contractor using suitable type membrane.
      b. Sand-Poly-Sand slab construction is not an acceptable construction.
   5. Thresholds - Section 08 7100.
   6. Game Standard Inserts - Section 11 6623.

1.03 QUALITY ASSURANCE

A. Floor System Manufacturer Qualifications
   1. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years.
   2. Manufacturer shall be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).

B. Floor Contractor/Installer Qualifications and Certifications
   1. Flooring contractor shall be a firm experienced in flooring field and approved by manufacturer.
   2. Submit a list of at least three completed projects of similar magnitude and complexity completed under current corporate identity.

C. Surface Appearance
   1. Expansion spaces will not exceed 1/64" at time of installation and will be spread evenly across the floor with each row of flooring.
   2. Expansion spacing will be installed to allow for normal expected increases in Equilibrium Wood Moisture Content (EMC).

D. DIN Performance Testing
   1. Passes all criteria of DIN 18032 part 2.

1.04 SUBMITTALS

A. Manufacturer's Qualification Data
   1. Submit a list of at least three completed projects of similar magnitude and complexity under current corporate identity.

B. Manufacturer's Product Data

1. Submit three copies of manufacturer's product information, drawings, and specification sheets.
2. Suppliers shall submit certificates attesting that materials furnished will meet specifications for grade, quality, dryness and treatment, if required.

C. Concrete Guidelines
1. Submit three copies of MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.
2. Submit manufacturer's "Concrete Guide Specification" for further information regarding conditions and requirements of concrete prior to installation.

D. Samples
1. Submit one sample of flooring assembly. Sample to be made by the manufacturer and so indicated.

E. Maintenance Literature
1. Submit copy of Maintenance Instructions.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials
1. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80 degrees Fahrenheit and relative humidity of 35-50% are to be maintained. In-Slab Relative Humidity shall be 85% or less using ASTM F2170 In-Slab Relative Humidity test. Ideal installation/storage conditions are the same as those that will prevail when building is occupied.
2. Materials shall not be stored at the installation location if the In-Slab relative humidity level for the concrete slab is above 85% using ASTM F 2170 In-Slab Relative Humidity test.

1.06 JOB CONDITIONS-SEQUENCY

A. Do not install floor system until concrete has cured 60 days and requirements in "Delivery of Materials" paragraph above are obtained.

B. General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.

C. Concrete slab shall be bead-blasted prior to installation of wood floor adhesive system to insure proper bond and eliminate foreign contaminants.

D. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.

E. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of area with specified flooring, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner’s agent) of complete gymnasium floor.

1.07 GUARANTEE

A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.

B. Manufacturer hereby warrants the Product material to be free from manufacturing defects for a period of 1 year.

C. This warranty is in lieu of all other warranties, expressed or implied including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of manufacturer. In the event of breach of any warranty, the liability of the manufacturer shall be limited to repairing or replacing product and system components supplied by manufacturer and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

PART 2 - PRODUCTS

2.01 MANUFACTURERS/PRODUCT

A. Robbins Sport Surfaces, Cincinnati, OH, 800-543-1913, [Basis of Design]: www.robbinsfloor.com.

2.02 MATERIALS (GYM FLOOR)

A. System: Bio-Channel SB System, or approved equal.
   1. Acceptable Manufacturers provided they meet guidelines for wood dimension and adhesive composition:
      a. Conner Sports Flooring; "Focus": www.connorfloor.com.
      b. Horner Flooring; "Zenith LP": www.hornerflooring.com.

B. Vapor Barrier
   1. 6-mil polyethylene.

C. Subfloor
   1. Zero/G Lineal Strip shock pad.
   2. Bio-Channel SB Subfloor panels:
      a. 25/32" factory engineered panels, on-site lamination shall not be permitted.
      b. Pre-determined, factory routed locations to accept resilient Zero/G pad.
      c. Pre-determined, factory routed locations to accept linear anchor channel.
   3. 16-gauge coated metal anchor channels.

D. Maple Flooring
   1. 25/32” thick x 2-1/4” wide, 2nd and Btr Grade, Random length, unfinished TGEM, KD Northern Hard Maple, as manufactured by Robbins and graded in accordance with MFMA rules.

E. Fasteners
   1. Flooring – 1-3/4" cleats or staples.
   2. Subfloor Channel Anchors – Powers SPIKE® anchors.

F. Finishing Materials
   1. Robbins Miracle or approved equal oil-modified polyurethane sealer and finish.

G. Gamelines
   1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.

H. Perimeter Base - Robbins 3” x 4” ventilating type. (Color: As selected.)

2.03 ACCESSORIES

A. Accessory items recommended by manufacturer for complete system.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8” in a 10’ radius. Moisture content of the concrete slab shall not exceed manufacturer recommendations using ASTM F 2170 In-Slab Relative Humidity test.

B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the General Contractor.

C. Subfloor shall be broom cleaned by General Contractor.

D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

E. Area of floor shall be turned over to the Contractor free of all equipment and debris, and broom clean.

3.02 INSTALLATION

A. Vapor Barrier

1. Install polyethylene with joints lapped minimum 6” and turned up 4” at the walls.

B. Subfloor
1. Install manufacturer's resilient pads per manufacturer’s recommendations.
2. Place Bio-Channel SB subfloor panels diagonally to strip flooring, in an end-to-end manner, staggering end joints in adjacent rows. Allow a 1/4" gap between panels. Provide 1-1/2" to 2" expansion void at the perimeter and all vertical obstructions.
3. Install solid stop blocking as needed.

C. Anchoring
1. Place anchor channel and anchor at each anchoring location. These anchor locations shall be perpendicular to the finished floor to allow for lateral movement. Anchors shall be driven tight to the concrete to insure proper placement. Anchors that need to be shimmed are not permitted.

D. Maple Flooring
1. Machine nail maple finish flooring per manufacturer's instructions. Provide spacing for humidity conditions in specific regions. Provide 2" expansion voids at perimeter and all vertical obstructions.

3.03 FINISHING

A. Sanding
1. Sand per manufacturer’s recommendations.
2. After sanding, buff entire floor with 100 grit screen or equivalent grit sandpaper, with a heavy-duty buffing machine.
3. Inspect entire area of floor to insure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
4. Vacuum and/or tack floor before first coat of seal.
5. Floor should be clean and completely free of dirt and sanding dust.

B. Finishing
1. Gymnasium:
a. Apply specified combination of seal, gameline paint, and finish in accordance with manufacturer’s instructions.
b. Buff and vacuum and/or tack between each coat after it dries.
c. Apply game lines accurately after the buffing and vacuuming the coated surfaces. Game lines shall be painted between seal coats and finish coats. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.
d. Apply finish coats per manufacturer’s recommendations.

3.04 WALL BASE INSTALLATION

A. Install manufacturer's vent cove base anchored to walls with base cement or screws and anchors. Use pre-molded outside corners and neatly mitered inside corner.

3.05 CLEANING

A. Clean up all unused materials and debris and remove it from the premises.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

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

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

B. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2021a.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

D. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards; Revision E, 1994.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit one sample, 9 by 9 inch in size illustrating color and pattern for each resilient flooring product specified, and two 3 by 3 inch samples.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: Provide minimum of 5% of each type and color.
   3. Extra Wall Base: Provide minimum of 5% of each type and color.
   4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. Pre-Installation Testing: Conduct pre-installation testing as follows: Moisture tests, Bond test, and pH test.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
   1. Material should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational, controlled and set at a minimum of 68º F (20º C) for at least 48 hours prior to the installation.

1.08 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.09 WARRANTY

A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

C. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Rubber Sheet Flooring:
   1. Manufacturers:
      a. Ecosurfaces: Strait Rx; www.ecosurfaces.com
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Thickness: See finish Legend
   3. Color: As indicated on drawings.

2.02 RESILIENT TILE FLOORING

A. Luxury Vinyl Tile (LVT):
   1. Minimum Requirements: Comply with ASTM F 1700 Class III, Type B - Embossed Surface.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   3. Smoke Developed: 450 or less, when in accordance with ASTM E 662.
   4. Static Load Limit: 250 psi, when tested in accordance with ASTM F 970 (modified).
   5. Size: See Finish Legend.
   6. Wear Layer Thickness: 0.020 inch (nominal).
   7. Total Thickness: See finish legend.
   8. Durability: 0.125 inch - Very Good.
   9. Maintainability: 0.125 inch - Excellent.
   10. Resilience: 0.125 inch - Excellent.
   11. Manufacturer/ Style/ Color: See Finish Legend.

2.03 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch deep.
   1. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.

2. Nominal Thickness: 0.210 inch.
3. Nosing: Square, unless indicated otherwise.
4. Style: Contrasting color abrasive grit strips full width.
5. Color: Solid. Refer to Finish Legend.
6. Manufacturers:
    a. Johnsonite, a Tarkett Company: www.johnsonite.com.
    b. Roppe Corp: www.roppe.com.
    c. Zandur: www.zandur.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

B. Stair Landings: Rubber Tile (Where indicated on Finish Legend and Schedules): Same dye lot as rubber stair treads. Color must match rubber stair tread and riser unit exactly in color, pattern and surface texture. Homogeneous color and pattern throughout thickness, and:
1. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
2. Design: See Finish Legend.
3. Size: See Finish Legend.
4. Overall Thickness: 0.125 inch.
5. Pattern: See Finish Legend.
6. Manufacturers:
    a. Johnsonite, a Tarkett Company; {Basis of Design]: www.johnsonite.com.
    b. Roppe Corporation, U.S.A.: www.roppe.com.
    c. Zandur: www.zandur.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
1. Height: See Finish Legend.
2. Thickness: 0.125 inch.
3. Finish: As selected by Architect.
4. Length: Roll.
5. Accessories: Premolded external corners.
6. Manufacturers:
    a. Johnsonite, a Tarkett Company: www.johnsonite.com. [basis of design]
    b. Roppe Corporation: www.roppe.com
    c. Substitutions: See Section01 6000-Product Requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

F. Confirm tiles are square and true. Cull all non-conforming tiles.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

C. Clean substrate.

D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's instructions. See finish plans for pattern and tile layout.

C. Fit joints tightly. Window panes in tiles are not acceptable.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. General Requirement: All resilient tile shall be from one manufacturer.

D. Installation of resilient tile:
   1. Installer shall dry lay all waterjet designs prior to final installation.
   2. Installer shall notify waterjet company of any concerns prior to final installation.
   3. Install according to manufacturer’s recommendations.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 72 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax resilient flooring in accordance with manufacturer's instructions, and also upon coordination with manufacturer's representative and Architect.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.09 SCHEDULE

A. See Drawings.

END OF SECTION

SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied, homogeneous polyurethane flooring.

B. Fluid-applied polyurethane flooring over rubberized base mat.

C. Painted game lines.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

C. Section 09 6500 - Resilient Flooring.

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

F. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2011 (Reapproved 2019).

G. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification; 2006.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

E. Test Reports: Submit test reports showing compliance with DIN EN 14904.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Manufacturer's Instructions: Indicate standard and special installation procedures.

H. Installer's qualification statement.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

1.08 GUARANTEE

A. Manufacturer's Warranty (or Equivalent):
   1. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
   2. Robbins, Inc. hereby warrants the Pulastic Classic 90 material to be free from manufacturing defects for a period of 25 years. This warranty is in lieu of all other warranties, expressed or implied including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of Robbins. In the event of breach of any warranty, the liability of Robbins shall be limited to repairing or replacing Pulastic Classic 90 material and system components supplied by Robbins and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

B. Warranty Period: Free from manufacturing defects for a period of at least 25 years

PART 2 PRODUCTS

2.01 FLUID-APPLIED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Action Floor Systems; Herculan MF: www.actionfloors.com/#sle.
   2. Connor Sports Flooring; _____: www.connorfloor.com/#sle.
   3. Dynamic Sports Construction Inc; _____: www.dynamicsportsconstruction.com/#sle.
   4. Robbins Sports Surface : www.robbinsfloor.com/#sle. (BASIS OF DESIGN) Pulastics Classic 90
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Homogeneous Polyurethane Flooring System, Type _____:
   1. Total System Thickness: Minimum 23/64 inch.
   2. Primer: Manufacturer's recommended standard for project substrate.
   3. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, with properties as follows:
      a. Formulation: Mercury catalyzed.
      b. Tensile Strength: Minimum 400 psi, per ASTM D412.
      c. Hardness: 50 to 60, when tested in accordance with ASTM D2240 using Type A durometer.
      d. Temperature Stability: Unaffected over range of 0 to 120 degrees F.
      e. Ultimate Elongation: Minimum 250 percent, per ASTM D412.
   4. Finish Coating: Manufacturer's standard pigmented, two-component polyurethane wear layer.
      a. Color: As selected from manufacturer's standard range.
      b. Finish: Smooth gymnasium.

C. Polyurethane Flooring Over Rubberized Base Mat: Robbins Pulastics Classics 90
   1. Total System Thickness: Minimum 1/4 inch; with minimum 0.07 inch polyurethane.

2. Base Mat: Prefabricated rubber mat of recycled rubber granules in polyurethane binder.
3. Sealer: Manufacturer's standard two-component polyurethane compound designed to seal base mat before application of resin topcoat.
4. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, zero mercury formulation, with properties as follows:
   a. Tensile strength: Minimum 1000 psi, per ASTM D412.
   b. Durometer Hardness, Type A: Minimum of 70, when tested in accordance with ASTM D2240.
   c. Ultimate Elongation: Minimum 100 percent, per ASTM D412.
5. Finish: Manufacturer's standard pigmented two-component polyurethane topcoat, matte finish, in color as selected from manufacturer's standard range.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Fluid-Applied, Homogeneous Polyurethane Flooring:
   1. Mix components in strict accordance with manufacturer's written instructions. Apply at manufacturer's recommended rates using airless spray equipment. Allow sufficient time to dry completely between coatings.
   2. Apply primer over prepared substrate.

3. Apply base layer and one or more top layers in strict compliance with manufacturer's recommendations to achieve minimum thickness specified.
4. Apply finish coating to achieve an even, consistent appearance.
5. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.

D. Fluid-Applied Polyurethane Flooring Over Base Mat:
1. Mix components in strict accordance with manufacturer's written instructions, and apply at manufacturer's recommended rates. Allow sufficient curing time between coatings.
2. Unroll base mat and allow to relax before beginning installation.
3. Apply adhesive to substrate with notched trowel, and roll base mat into fresh adhesive. Do not allow compression fit at any seams. Roll mat with weighted linoleum roller immediately upon application of base mat and again after 45 minutes to insure that base mat is firmly adhered to substrate.
4. Thoroughly mix and apply seal coat to surface of base mat with steel trowel.
5. Apply resin wear layer in number of lifts recommended by manufacturer, applying wet-into-wet to achieve a seamless surface. Sand any imperfections in surface after wear layer has cured.
6. Thoroughly mix and apply finish coat with airless sprayer to achieve uniform appearance.
7. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 6723.02
DECORATIVE FLAKE RESINOUS FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes one resinous flooring system, one with epoxy body.
   1. Application Method: Squeegee, screed, and broadcast.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Verification: For each resinous flooring system required, 5 inches (150 mm) square, applied to a rigid backing.

C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on Drawings in product schedule.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy based flake broadcast with mortar coat). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted 10 days prior to bid date. Request will be subject to specification requirements described in this section.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
   1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
   2. Contractor shall have completed at least 10 projects of similar size and complexity.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

D. Manufacturer Field Technical Service Representatives: Resinous flooring manufacture shall retain the services of Field Technical Service Representatives who are trained specifically on installing the system to be used on the project.
   1. Field Technical Services Representatives shall be employed by the system manufacture to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.

E. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Apply full-thickness mockups on 48-inch- (1200-mm-) square floor area selected by Architect.
      a. Include 48-inch (1200-mm) length of integral cove base.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Pre-installation Conference:
1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
2. Attendance:
a. General Contractor
b. Architect/Owner's Representative.
c. Manufacturer/Installer's Representative.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects. Store material per product data sheet.

C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
1. Maintain material and substrate temperature between 65 and 85 deg F (18 and 30 deg C) during resinous flooring application and for not less than 24 hours after application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

D. Concrete substrate shall be properly cured. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring

1.07 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 PRODUCTS

2.01 RESINOUS FLOORING

A. Available Products: Subject to compliance with requirements.
1. Confirm inclusion of 25mil body coat, and broadcast quartz into primer increasing bond strength. Products that may be incorporated into the work include,

B. Products: Subject to compliance with requirements:
1. Stonhard, Inc.; Stontec ERF®. Basis of Design.
2. Tnemec
3. Substitutions: Reference Section 01 6000

C. System Characteristics:
1. Color and Pattern: Select from manufactures standards
2. Wearing Surface: Standard
3. Integral Cove Base: 6"

4. Overall System Thickness: 2mm

D. System Components: Manufacturer's standard components that are compatible with each other and as follows:
   1. Primer:
      a. Material Basis: Stonhard Standard Primer
      b. Resin: Epoxy
      c. Formulation Description: (2) two component 100 percent solids.
      d. Application Method: Squeegee and roller.
      e. Number of Coats: (1) one.
      f. Aggregates: Broadcast quartz into wet primer coat.
   2. Body Coat(s):
      a. Material Basis: Stonshield Undercoat.
      b. Resin: Epoxy.
      c. Formulation Description: (3) three component solvent free epoxy.
      d. Application Method: Notched squeegee.
         1) Thickness of Coats: 25-30 mils with standard primer coat
         2) Number of Coats: (1) One.
   3. Broadcast:
      a. Material Basis: Stontec Flakes
      b. Formulation Description: Decorative flake (1/8")
      c. Type: Tweed (chips to be mixed in Mfg. facility)
      d. Finish: Broadcast to rejection.
      e. Number of Coats: one.
      f. Color: See Finish Legend
   4. Topcoat:
      a. Material Basis: Stonkote CE4
      b. Resin: Epoxy.
      c. Formulation Description: (2) component, UV stable, solvent free epoxy.
      d. Type: Clear.
      e. Finish: Gloss
      f. Number of Coats: Two.

NOTE: COMPONENTS LISTED ABOVE ARE THE BASIS OF DESIGN INTENT; ALL BIDS WILL BE COMPARED TO THIS STANDARD INCLUDING RESIN CHEMISTRY, COLOR, WEARING SURFACE, THICKNESS, AND INSTALLATION PROCEDURES, INCLUDING NUMBER OF COATS. CONTRACTOR SHALL BE REQUIRED TO COMPLY WITH ALL THE REQUIREMENTS OF THE SPECIFICATIONS AND ALL OF THE COMPONENTS REQUIRED BY THE SPECIFICATIONS, WHETHER OR NOT SUCH PRODUCTS ARE SPECIFICALLY LISTED ABOVE.

A. System Physical Properties
   1. Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
   2. Tensile Strength: 5,200 psi per ASTM D-638
   3. Flexural Strength: 4,000 psi per ASTM D-790
   4. Flexural Modulus of Elasticity: 1.7 x 10^6 psi per ASTM D-790
   5. Hardness: .85 to .90 per ASTM D-2240, Shore D
   6. Linear Coefficient of Thermal Expansion: 17 x 10^-6 in./in.℉ per ASTM C-531
   7. Impact Resistance: Exceeds 160 in.-lbs. per ASTM D-4060, CS-17
   8. Abrasion Resistance: 0.03 gm max. weight loss per ASTM D-4060, CS-17
   9. Flammability: Class I per ASTM E-648

1.02 ACCESSORY MATERIALS

A. Patching, Leveling and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated. No Single component or cementitious materials.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 EXECUTION

2.01 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean and dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
   1. Mechanically prepare substrates as follows:
      a. Mechanically prepare with the use of Diamond grinding equipment to provide surface sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring. Or,
      b. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup or Diamond Grind with a dust free system.
      c. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
   2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
   3. Verify that concrete substrates meet the following requirements.
      a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 80 percent.
      b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab in 24 hours.

C. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

D. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for Stonflex MP7 joint fill material.

2.02 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
      a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates

C. Broadcast: Immediately broadcast quartz silica aggregate into the primer using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners. Refer to detail drawings.

E. Body coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

F. Broadcast: Immediately broadcast decorative flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

G. First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

H. Second sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

2.03 TERMINATIONS

A. Chase edges to “lock” the coating system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue coating system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the coating to lock in place at point of termination.

2.04 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Vertical and horizontal contraction and expansion joints are treated by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

2.05 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any numbers of times during resinous flooring application require material samples for testing for compliance with requirements.
   1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
   3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

2.06 CLEANING, PROTECTING, AND CURING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer. General Contractor is responsible for cleaning prior to inspection.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

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

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

C. Section 09 6500 - Resilient Flooring.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

E. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Accessory Samples: Submit two 6 inch long samples of edge strip, base cap, and stair nosing.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 MAINTENANCE MATERIALS

A. Furnish the following for Owner's use in maintenance of project.

B. See Section 01 6000 - Product Requirements, for additional provisions.

C. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. See Finish Legend and Schedule for manufacturer.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting: Fusion bonded, manufactured in one color dye lot.
   1. Tile Size: As indicated on drawings.
   2. Color: As indicated on drawings.
   3. Pattern: As indicated on drawings..
   4. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
   6. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.
   7. Pile Height: 1/2" maximum.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09 9100
PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints and other coatings. High-performance coating at entrance canopy is to be performed under Section 09 9600 - High Performance Coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished (pre-finished) and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Exposed surfaces of steel lintels and ledge angles.
   3. Mechanical and Electrical:
      a. In all areas, paint gas piping only. See items scheduled NOT to be painted below.
      b. In all areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished (pre-finished) unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically so indicated.
   9. Ceramic and other tiles.
   10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Brick, and cast stone.
   12. Exterior insulation and finish system (EIFS).
   13. Glass.
   14. Acoustical materials, unless specifically so indicated.
   15. Concealed pipes, ducts, and conduits.
   16. Door hinges, hardware, or fire door labels.
   17. Rusty or corroded surfaces until sandblasted or wire-brushed free of corrosion, and wiped clean.
   18. Mechanical and Electrical:
      a. In all areas, do NOT paint insulated and exposed pipes (except gas piping), conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

1.02 RELATED REQUIREMENTS

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

B. Section 04 2000 - Unit Masonry Assemblies: Faces to be painted in this section.

C. Section 05 1200 - Structural Steel: Steel framing to be field painted.

D. Section 05 2100 - Steel Joist Framing: Steel joists to be field painted.

E. Section 05 3100 - Steel Decking: Prefinished steel decking to be protected from overspray during overhead painting operations.

F. Section 05 5000 - Metal Fabrications: Shop-primed items.

G. Section 07 0553 - Fire and Smoke Assembly Identification.

H. Section 08 1113 - Steel Doors and Frames: Shop-primed steel doors and frames.

I. Section 09 2116 - Gypsum Board Assemblies.

J. Section 09 9600 - High Performace Coatings: High performance coatings for exterior steel entrance canopy structure.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2012.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

1.04 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all finishing products and special coatings, including VOC content.
   1. List each material and cross reference to scheduled paint types, and including each specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.

C. Samples for initial color selection in the form of manufacturer's color charts from paint/coating manufacturer intended for use.

D. Samples: Submit two paper chip samples, 4x8 inch in size illustrating range of colors available for each surface finishing product scheduled.

E. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

F. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

H. Applicator certifications that are required to be in writing.

I. Submit Manufacture Representative reports as outlined in Field Quality Control below.

J. Coating Maintenance Manual: Upon conclusion of the Project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as S-W "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product / color / finish was used, product data pages, Material Safety Data Sheet (MSDS), care and cleaning instructions, and Touch-up procedures.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

C. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by paint manufacturer, and use only within the recommended limits.

D. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify the Architect of any problems anticipated using the materials specified, prior to proceeding with work.

E. Material Quality: Provide the manufacturer's best quality grade paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude approved equivalent products of other manufacturers.

F. Location of Mock-Up shall be where directed. Mock-Up shall consist of complete application of coating system to full wall. Verify location with Architect before constructing.

G. Mock-Up: Provide mock-up at least 3 ft x 3 ft of general wall paint and trim for Architect's and Owner's review. Mock-Up guidelines as described in Section 01 4000 - Quality Requirements.

H. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

I. Lead content in pigments or other painting materials and components is not allowed.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, pigment and vehicle constituents by volume, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

D. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers, others present or passing through or inspecting work areas (painting or any other work), and the work areas themselves are protected from fire and health hazards resulting from handling, mixing, and application of materials.

1.09 PROJECT CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer, during application, drying and curing periods.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for solvent-thinned Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 MAINTENANCE MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Supply one (1) gallon of each color and type; store where directed.

C. Label each container with color, type, and room locations in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

B. Paints:
1. Basis of Design: Sherwin-Williams: www.sherwin-williams.com.
2. Other Acceptable Manufacturers:
   a. Benjamin Moore & Co: www.benjaminmoore.com.
   b. PPG Architectural Finishes, Inc: www.ppgaf.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

C. Block Fillers: Same manufacturer as top coats.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each coating material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. Architectural coatings VOC limits of State in which the project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Colors: As indicated on drawings
1. In all areas, finish pipes, ducts, conduit, and equipment the colors as indicated on drawings. Refer to Finish Legend.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint WE-TR-St - Wood, Stained.
1. Two Coats: S-W: Woodscapes Exterior Waterborne Semi-Transparent Polyurethane Stain, A15T5 (for vertical use).
2. Two Coats: S-W: SuperDeck S/T Waterborne Stain, 2650 Series.

B. Paint CppE-OP-3A - Concrete, Poured and Precast:
   1. One Coat: S-W: Loxon Concrete & Masonry Primer, A24W8300, (<100 g/l voc).
   2. Two Coats: S-W: SuperPaint Acrylic Exterior House Paint (Flat, A80-100 series) (Satin, A89-100 Series) (Gloss, A84-100 Series) - Architect to select finish required (<50 g/l voc).

C. Paint CE-OP-3A - Masonry, Opaque, (One filler coat and two acrylic finish coats):
   1. One Coat: S-W: PrepRite Interior / Exterior Acrylic Block Filler, B25W25 (<50 g/l voc) (as required to be pinhole-free).
   2. Two Coats: S-W: SuperPaint Exterior Acrylic House Paint, Gloss, A84-100 Series (<50 g/l voc).

D. Paint GEfibcem-OP-3A - Fiber Cement Board, Acrylic Primer and Paint, 3 Coat:
   1. One Coat: S-W: Loxon Latex Primer, A24 (if unprimed).
   2. Two Coats: S-W: A100 Exterior Acrylic House Paint, A82. More coats if needed to cover all fibering. Sheen: As selected from gloss or satin.

E. Paint GEsof-OP-3A - Gypsum Board Soffit (Glass-mat faced), Acrylic Primer and Paint, 3 Coat:
   1. One Coat: S-W: Multi-Surface Interior/Exterior Acrylic Primer Sealer, B51W450.
   2. Two Coats: S-W: SuperPaint Acrylic Exterior House Paint (Flat, A80-100series) (Satin, A89-100 Series) (Gloss, A84-100 Series) - Architect to select finish required (<50g/l voc).

F. Paint ME-OP-3A - Ferrous Metals, Unprimed, 100% Acrylic, 3 Coat:
   1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 (<100 g/l voc).
   2. Two Coats: S-W: Sher-Cryl High Performance Acrylic, Gloss, B66-300 (<200 g/l voc).

G. Paint ME-OP-2A - Ferrous Metals, Primed, Acrylic Latex, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Two Coats: S-W: Sher-Cryl High Performance Acrylic, Gloss, B66-100 (<200 g/l voc).

H. Paint MgE-OP-3A - Galvanized Metals, Acrylic, Opaque, 3 Coat:
   1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Metal Primer, B66-300 (<100 g/l voc).
   2. Two Coats: S-W: Sher-Cryl High Performance Semi-Gloss, B66-350 (<200 g/l voc).

2.04 PAINT SYSTEMS - INTERIOR

A. Paint WI-OP-3A - Wood, Opaque, Acrylic Latex, 3 Coat:
   1. One Coat: S-W: Multi-Purpose Interior / Exterior Latex Primer /Sealer, B51-450 Series (<50 g/l voc).
   2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel Enamel, B20-2600 (0 g/l voc).

B. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:
   1. Filler coat: S-W: As required.
   2. One coat of stain; S-W: WoodClassics “250” Interior Wood Stain, A49-800 Series (<250 g/l voc). Option: S-W: MinWax “250” VOC Stain (<250 g/l voc).
   3. One coat sealer; S-W: none required.
   4. Two coats; S-W: WoodClassics Waterbased Polyurethane, A68 Series (<350 g/l voc). Option: MinWax Waterbased Polyurethane Varnish: Satin (710337), Semi-Gloss (710320), Gloss (710313) (<350 g/l voc).

C. Paint CppI-OP-3A - Concrete, Poured and Precast, Opaque, Acrylic, 3 coats.
   1. One Coat: S-W: Loxon Concrete & Masonry Primer, A24W8300 (<100 g/l voc).
   2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).

D. Paint CI-OP-3L - Masonry, Opaque, Latex, 3 Coat:
   1. One Coat: S-W: Pro Industrial Heavy Duty Block Filler, B42W150. (Required to be pin-hole free).
   2. Two Coats: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).

E. Paint MI-OP-3A - Ferrous Metals, Unprimed, Acrylic, 3 Coat:
   1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-310 (<100 g/l voc).
   2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).

F. Paint MI-OP-2A - Ferrous Metals, Acrylic Primed, Acrylic-Alkyd Finish, 2 Coat:

1. One Coat: Touch up with primer: S-W: Pro Industrial Pro-Cryl Universal Acrylic Primer, B66-310 (<100 g/l voc).
2. Two Coats: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200 Series.

G. Paint MgI-OP-3A - Galvanized Metals, Acrylic, 3 Coat:
1. One Coat: S-W: Pro Industrial Pro-Cryl Universal Primer, B66-310 (<100 g/l voc).
2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel, B31-2600 (0 g/l voc).

H. Paint CI-OP-3E - Concrete/Masonry [Inside Face of Single-Wythe Exterior Concrete Block Walls, and in Rest Rooms and other Wet Areas], Epoxy Enamel, 3 Coat:
1. One Coat: S-W: Kem Cati-Coat HS Epoxy Filler Sealer, B42W400. (Required to be pin-hole free) (Trowel to smooth finish may be required).
2. Two coats of waterborne epoxy polyamide (two-component, chemically-cured waterborne epoxy coating for use as a high performance architectural coating). S-W: Pro Industrial Water Based Catalyzed Epoxy (B73-300, Gloss) or (B73-360 EgShel). Architect to select finish required.

I. Paint GI-OP-3E - Gypsum Board, Epoxy, 3 Coat:
1. One coat of best commercial grade acrylic drywall primer, or as recommended by paint manufacturer. S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (0 g/l voc).
2. Semi-gloss: Two coats of S-W K46 Pro Industrial Precatalyzed Waterbased Epoxy. Scrub Resistance: 500-600 cycles per ASTM D 2486. MPI # 141, & 153, (145 g/L).

J. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
1. One Coat: S-W: ProMar 200 Zero VOC Interior Latex Primer, B28-2600 (0 g/l voc).
2. Two Coats: S-W: ProMar 200 Zero VOC Interior Latex EgShel, B20-2600 (0 g/l voc). (Where Sheen is indicated "Gloss", provide Pro Industrial™ High Performance Acrylic, B66-600 Series, <50 g/l voc).

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

E. All surfaces to be pinhole free.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

J. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

K. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

L. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

M. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

N. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's instructions.

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. All surfaces shall be pinhole-free.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

H. Sand wood and metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 23 and 26 Sections for scheduling of color coding of equipment, duct work, piping, and conduit.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

B. Architect shall approve surface prior to finish coats being applied.

C. Manufacturers Representative shall visit the site a minimum of 3 times. These visits shall be at the beginning , middle and completion of work.

1. The beginning visit shall review the substrate for compliance prior to installation and for appropriate use of products.
2. The middle visit shall review the progress and performance of the installer.
3. The final visit shall review the quality of the final product.
4. The manufacturer shall submit reports to the Contractor and the Architect within 72 hours of each visit. The letter shall document observations, instructions to Contractor, and any remediations required and/or completed.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean paint from all electrical devices, mechanical devices, door hardware, architectural items, and other permanent materials.

3.07 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

3.08 SCHEDULE - SURFACES TO BE FINISHED

A. See drawings for surfaces to be painted.

END OF SECTION

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Building identification signs.

1.02 RELATED REQUIREMENTS

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

B. Section 09 9600 - High Performance Coatings: Finishing of exterior building identification sign.

C. Division 22 - Mechanical Identification.

D. Division 26 - Electrical Identification.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's Qualification Statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

1.08 WARRANTY

A. Provide manufacturer's standard warranty against defects in materials and workmanship for minimum 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat (Interior) Signs:
   1. Basis of Design: APCO "Elevate" Signs; www.apcosigns.com.
   2. Other Acceptable Manufacturers:
      a. TakeForm, Inc.; www.takeform.net.
      b. Best Sign Systems, Inc: www.bestsigns.com/#sle.
      c. Inpro: www.inprocorp.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Exterior Building Identification Signs:
   1. Andco Industries Corporation.
   2. Cosco Industries: www.coscoarchitecturalsigns.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Leeds Architectural Letters, Inc..
   5. Substitutions: See Section 01 6000 - Product Requirements.

C. Plaques:
   1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
   2. FASTSIGNS; _____: www.fastsigns.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room, Directional, Informational, and Door Signs: Provide interior signage as indicated on the drawings.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch unless indicated otherwise.

C. Building Identification Signs:
   1. Provide building identification sign as indicated on the drawings. Use metal components to match the exterior signage illustrated on the drawings.
   2. Shop prime and field finish the sign as indicated, in color to be selected by Archtect.
   3. Mount on exterior as indicated on drawings.

2.03 SIGN TYPES

A. Flat Signs: As indicated on the drawings.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.
   4. Wall "Flag" Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: As indicated on drawings.
   2. Character Case: Upper and lower case (title case).
   3. Background Color: As scheduled.
   4. Character Color: Contrasting color.

2.04 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

2.05 PLAQUES

A. Metal Plaques:
   1. Metal: Aluminum casting.
   2. Metal Thickness: 1/8 inch, minimum.
   3. Size: 24 inches by 36 inches.
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper case only.
      c. Character Color: Contrast with background color.
   5. Border Style: As indicated on drawings.
   6. Background Texture: Ripple.
   7. Surface Finish: Brushed, satin.
   8. Painted Background Color: Light oxide stain.
   9. Protective Coating: Manufacturer's standard clear coating.

2.06 EXTERIOR BUILDING IDENTIFICATION SIGNS

A. Metal Letters and Forms:
   1. Metal: Steel or Aluminum plate.
   2. Metal Thickness: 3/8 inch minimum.
   3. Text and Typeface:
      a. Character Font: To be selected.
      b. Character Case: To be selected.
   4. Finish: Finish shall be per Section 09 9600 - High Performance Coatings.
   5. Mounting: As indicated on drawings.

2.07 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

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SECTION 10 2113.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic (HDPE) toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

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

B. Section 05 1200 - Structural Steel Framing: Concealed steel support members.

C. Section 05 5000 - Metal Fabrications: Concealed steel support members.

D. Section 06 1000 - Rough Carpentry: Blocking and supports.

E. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in strict accordance with the manufactuers printed instructions.

1.07 WARRANTY

A. Provide manufacturer's standard written warranty on panels, pilasters, and doors against breakage, corrosion, and delamination; to be replaced without charge, including labor.

B. Warranty Term: Twenty-five (25) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Toilet Compartments:
   1. Basis of Design: Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.
   2. Other Acceptable Manufacturers:
      a. Partition Systems International of South Carolina: www.psisc.com.
      b. Global Partitions: www.globalpartitions.com.
   3. Substitutions: Section 01 6000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
   1. Color: Single color as selected.
   2. Doors:
      a. Thickness: 1 inch.
      b. Width: 24 inch.
      c. Width for Handicapped Use: 36 inch, out-swinging.
      d. Height: 58 inch.
   3. Panels:
      a. Thickness: 1 inch.
      b. Height: 58 inch.
      c. Depth: As indicated on drawings.
   4. Pilasters:
      a. Thickness: 1 inch.
      b. Width: As required to fit space; minimum 3 inch.
   5. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Extruded aluminum, anti-grip profile.
   1. Size: Manufacturer's standard size.

C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hinges: Stainless steel, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

F. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

G. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

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SECTION 102600

WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Furnish labor, equipment, material, and services to provide wall protection systems as specified in this Section in locations shown or scheduled on the Drawings.

B. This Section includes the following:

1. Corner guards.

C. Related Sections include the following:

1. Division 09 Section “Gypsum Wallboard Systems: for anchoring to wall framing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails: Provide handrails capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, anchors, and connections:

1. Concentrat4ed load of 200 lbf (890N) applied at any point and in any direction.

2. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.

B. Fire rating of Flush-Mounted Corner Guards: Where flush-mounted corner guards are scheduled, provide a continuous intumescent fire barrier at retainer that will provide a fire-resistance rating equal to the fire-resistance rating of the partition in which the corner guard is mounted.

1.4 SUBMITTALS:

A. Product Data: Include construction details, materials descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.

B. Shop Drawings: For each wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of 12 inches (300 mm) long for wall and corner guards and handrails, and of 6 inches (150 mm) square for wall and door protection.

D. Maintenance Data: For each wall-protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum conditio9n of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.5 QUALITY ASSURANCE:

A. Single-Source Limitations: Obtain wall-protection units through one source froma single manufacturer.

B. Basis Design: Drawings and Specifications indicate size, profiles, and dimensional requirements of wall-protection units and are based on the specific system indicated. Refer to Division 1 Section “Substitutions and Product Options.”

1. Do not modify intended aesthetic effects, as judged solely by Architect, expect with Architect’s approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Fire-Test-Response Characteristics: Provide plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTME 84, NFPA 255, or UL 723, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Store wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 60 deg F (15.5 degC) during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 60 deg F (15.5 C).
4. Store corner-guard covers in a vertical position.
5. Store wall-guards, bed-locators, and handrail covers in a horizontal position.

1.7 PROJECT CONDITIONS:

A. Environmental Limitations: Do not deliver or install wall-protection units until building is enclosed and weatherproof, we work is complete and dry, and HVAC system is operation and maintaining temperature between 70 and 75 deg F (21 and 24 deg C) for not less than 7 2 hours before beginning installation and for the remainder of the construction period. Allow materials to acclimate at room temperature a minimum of 24 hours before beginning installations.

B. Field Measurements: Verify actual locations of walls, columns and other construction continuous with wall-protection units by field measurement s before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTIES:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of wall-protection units that fail in materials and workmanship within specified warranty period.

1. Failures include, but are not limited to, structural failures and deterioration of plastic and other materials beyond normal use.
2. Warranty Period: File (5) years from date of Substantial Completion.

1.9 EXTRA MATERIALS:

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Guard and Handrail Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot (2.4m) long and one 4-foot (1.2m) long units.
2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than four, 4-foot (1.2m) long units.
3. Bed-Locator Covers: Full-size plastic covers equal to 2 percent of each type, color, and texture of units installed, but no fewer than 4 units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with specified requirements:

1. Johnsonite by Tarkett.
2. C/S North America (Lebanon, NJ): Acrovyn
3. InPro Corporation (Muskego, WI); IPC
4. Koroseal Wall Protection Systems (Fairlawn, OH); KoroGard

B. Design Basis Manufacturer: Drawings and Specifications are based on products manufactured by Johnsonite by Tarkett.

2.2 BASIC MATERIALS AND FINISHES:

A. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical and stain resistant, high impact resistant PVC or acrylic-modified vinyl plastic with integral color throughout: thickness as indicated.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543.
3. Fungal and Bacterial Resistance: No fungal or bacterial growth as tested in accordance with ASTM G21 and G22.
4. Self-extinguishing and when tested according to ASTM D 635.5. Flame-Spread Index: 35 or less.
5. Smoke-Developed Index: 450 or less.

B. Plastic Wall Protection Panel Material: ASTM D 1784, Class 1, textured, chemical-and stain- resistant, semirigid, high-impact-resistant PVC or acrylic-modified vinyl plastic sheet with integral color throughout; thickness an indicated.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543.
3. Fungal and Bacterial Resistance: No fungal or bacteriaol growth as tested in accordance with ASTM G21 and G22.
4. Self-extinguishing when tested according to ASTM D 635.5. Flame-Spread Intex: 25 or less.
5. Smoke-Developed Index: 450 or less.

C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view. Do not use steel components in areas influenced by the effects of magnetic imaging machines.

D. Adhesive: Type recommended by manufacturer for use with material being adhere to substrate indicated.

1. Use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24): a) Gypsum Board and Panel Adhesives: 50 g/L. b) Multipurpose Construction Adhesive: 70 g/L. c) Contact Adhesive: 250 g/L

   Mounting: Extended mounting on injection-molded plastic mounting brackets.
2. Accessories: Concealed splices and mounting hardware.

2.3 CORNER GUARDS:

A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-o9n plastic cover installed over continuous retainer; including mounting hardware; fabricated with corner degree turn to match wall condition.

1. Basis-of-Design Product: See Drawings.
2. Color and Texture: From manufacturer’s standard color selection.
3. Cover: Extruded rigid plastic, minimum 0.078 inch (2.0 mm) wall thickness.
   a. Height: See Drawings.
4. Retainer: Minimum 0.060 inch (1.5 mm) thick, 1-piece, extruded aluminum.

5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

1. Examine wall to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
2. For wall-protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION:

A. General: Install wall-protection units level plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install wall-protection units in locations and at mounting heights indicated on Drawings.

B. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

1. Provide anchoring devices to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305mm).
3. Adjust end and top caps as required to ensure tight seams.

C. Wall Protection Panels: Provide top and edge moldings, corners, and divider bars as required for a complete installation.

1. When installing vertical trim and wainscot trim, provide an additional thin coat of mastic on back side before sliding in place.

3.4 A. CLEANING:

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using method and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102813

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes: Toilet room accessories. The extent of toilet and other accessory items are indicated on the Drawings, and include the following:

1. Public-use washroom accessories.
2. Warm-air dryers.
3. Childcare accessories.
4. Underlavatory guards.
5. Custodial accessories.

B. Related Sections:

1. Division 4 Section – "Unit Masonry."
2. Division 9 Section – "Gypsum Board Assemblies."
3. Division 10 Section - "Toilet Compartments."

1.3 SUBMITTALS:

A. Product Data: Submit for each toilet accessory item specified, including details of construction relative to materials, dimensions, gauges, profiles, method of mounting, specified options, and finishes.

B. Product Schedule: Indicate types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using same designations indicated on Drawings.

C. Setting Drawings: Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

D. Maintenance Data: Submit toilet accessories manufacturers to include in maintenance manuals. Submit as part of contract closeout documents.

1.4 QUALITY ASSURANCE:

A. Single-Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

B. Regulatory Requirements: Comply with applicable provisions of the following regulations and standards for toilet and shower accessories installed at locations designated as accessible.

1. Code of Federal Regulations (CFR), Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
2. ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities.

C. Product Certification: Electric hand dryers shall be ETL listed by Intertek Group, plc or UL listed by Underwriters Laboratories, Inc. in conformance with UL 507 standard.

D. 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

1.5 COORDINATION:

A. Toilet Accessories: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

B. Grab Bar Anchor Plates: Coordinate installation of concealed anchor plates with drywall and masonry wall construction for mounting of grab bars.

C. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

1.6 WARRANTIES:

A. Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within warranty period of not less than Fifteen (15) years from date of Substantial Completion.

B. Hand Dryer Warranty: Manufacturer's standard form covering defects in materials and workmanship under normal use. Manufacturer agrees to replace or repair defective parts within warranty period of not less than Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with specified requirements:

1. American Specialties, Inc. (ASI).
2. Bobrick Washroom Equipment, Inc.

3. Bradley Corporation.

2.2 BASIC MATERIALS AND FINISHES:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gauge (.034-inch) minimum thickness, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16, Castings, ASTM B-30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gauge (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

H. Keys: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal access for servicing and resupply. Provide minimum of 6-keys to Owner's representative and obtain receipt.

2.3 PUBLIC-USE WASHROOM ACCESSORIES:

A. Toilet Tissue Dispenser (Standard Roll): TA01.

1. Basis-of-Design Product: Bobrick B-2840.
2. Description: Double-roll dispenser with utility shelf.
   a. Mounting: Surface mounted.
   b. Operation: Non-control delivery with theft-resistant spindle.
   c. Capacity: Up to 5 1/2-inch diameter tissue rolls.
   d. Material and Finish: Stainless steel, No. 4 satin finish, with high impact, black, polystyrene spindles.

B. Soap Dispenser, Foam Type, Manual: TA16.

1. Basis-of-Design Product: Sloan SJS-1100.
2. Description: Automatic Foam Soap Dispenser.
   a. Mounting: Wall mount, surface.
   b. Capacity: 34 fl. oz.
   c. Materials: Polished Chrome Plated Plastic.
   d. Refill Indicator: Window type.
   e. Accessories: Provide 2 refill bags for each unit.

C. Grab Bar (short): TA20.

1. Basis-of-Design Product: Bobrick B-6806 × 18.
2. Mounting: Flanges with concealed fasteners.
3. Material and Finish:
   a. Material: Stainless steel, 0.05 inch thick.
   b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Straight, 18 inches long.

D. Grab Bar (medium): TA21.

1. Basis-of-Design Product: Bobrick B-6806 × 36.
2. Mounting: Flanges with concealed fasteners.
3. Material and Finish:
   a. Material: Stainless steel, 0.05 inch thick.
   b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Straight, 36 inches long.

E. Grab Bar (long): TA22.

1. Basis-of-Design Product: Bobrick B-6806 × 42.
2. Mounting: Flanges with concealed fasteners.
3. Material and Finish:
   a. Material: Stainless steel, 0.05 inch thick.
   b. Finish: Smooth, No. 4 satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Straight, 42 inches long.

F. Mirror, Framed, without Shelf: TA23.

1. Basis-of-Design Product: Bobrick B-165-2436.
2. Frame: Stainless steel channel.
3. Corners: Mitered, welded, and ground smooth.
4. Hangers: Produce rigid, tamper and theft-resistant installation, using one-piece, galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
5. Size: 24 inches wide × 36 inches high.

G. Sanitary Napkin Disposal Unit, Surface-mount: TA29.

1. Basis-of-Design Product: Bobrick B-254.
2. Mounting: Surface mounted.

3. Door or Cover: Self-closing disposal opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4.

2.4 WARM AIR DRYERS:

A. Warm Air Dryer: TA50.

1. Basis-of-Design Product: Bobrick B-7128-115V.
2. Mounting: Surface mounted.
3. Operation: Electronic sensor activated with timed power cut-off switch.
4. Operation Time: 30 to 40 seconds.
5. Cover Material and Finish: Stainless steel, No. 4 satin finish.

2.5 CHILDCARE ACCESSORIES:

A. Diaper-Changing Station: TA55.

1. Basis-of-Design Product: Koala KB110-SSWM.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
   a. Engineered to support a minimum of 250-lb static load when opened.
   b. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
   c. Operation: By pneumatic shock-absorbing mechanism.
   d. Material and Finish: Stainless steel, No. 4 satin finish.
   e. Liner Dispenser: Built in.

2.6 UNDERLAVATORY GUARDS:

A. Underlavatory Guard: TA58.

1. Basis-of-Design Product: Plumberex Soft Guard Plus.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.7 CUSTODIAL ACCESSORIES:

A. Mop and Broom Holder: TA60.

1. Basis-of-Design Product: Bobrick B-224 × 36.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Three.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.

6. Material and Finish: Stainless steel, No. 4 satin finish.
   a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
   b. Rod: Approximately 1/4-inch-diameter stainless steel.

2.8 FABRICATION:

A. Manufacturer's Identification: Only a maximum 1-1/2-inch diameter, unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on an inconspicuous face of toilet or bath accessory units. Identification mark shall be located on either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories: Fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six (6) keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install toilet accessory units according to manufacturers' current written instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit.

B. Use concealed fastening methods for attachment of accessories unless otherwise specified by product types employing exposed fastener installations.

C. Install units plumb and level, firmly anchored in locations and at heights indicated.

D. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

1. Anchor grab bar to metal stud partitions using manufacturer's minimum 12-gauge (0.109-inch) thickness by 3-inches width steel anchor plates tapped to receive machine screws. Anchor plates shall be of continuous length required to facilitate attachment of grab bars, spanning between studs.
   a. Attach anchor plates to studs at grab bar mounting heights, using self-tapping sheet metal screws or by welding.
   b. Where grab bar mounting flanges require attachment at different walls or at vertical or angled positions, provide anchor plates of lengths to span between studs at each flange location.

c. Secure grab bars to anchor plates using 1/4-inch diameter stainless steel machine screws.

2. Mount grab bars to masonry and concrete walls using 1/4-inch diameter stainless steel machine screws and expansions shields.

E. Make electrical connections to hand dryers complying with requirements specified in Division 26-Electrical sections.

3.2 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings and films prior to cleaning.

C. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102813

SECTION 10 7300
ALUMINUM WALKWAY COVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Design, fabrication, and installation of welded extruded aluminum walkway cover systems.

B. Products Furnished but not Installed Under this Section: Column sleeves (styrofoam blockouts) or anchor bolts (if required)

1.02 REFERENCES

A. The Aluminum Association (AA):
   1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American Society of Civil Engineers (ASCE):
   1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.

D. American Society for Testing and Materials (ASTM):
   1. ASTM B 209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.
   2. ASTM B 221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM C 150, Specification for Portland Cement.
   4. ASTM C 404, Specification for Aggregates for Masonry Grout.

E. American Welding Society (AWS):
   1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design Walkways in accordance with The Aluminum Design Manual 2000.
   2. Comply with the wind requirements of ASCE 7.
   3. Provide an all welded extruded aluminum system complete with internal drainage. Non-welded systems are not acceptable.
   4. Provide expansion joints to accommodate temperature changes of 120 degrees F. Provide expansion joints with no metal to metal contact.

B. Performance Requirements:

1. Grout: Compressive strength of 2000 psi, minimum.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product information, specifications, and installation instructions for walkway cover components and accessories.

B. Shop Drawings: Include plan dimensions, elevations, and details.

C. Samples:
1. Selection: Manufacturer's standard range of colors for the finishes selected.
2. Verification: 2-inch-square samples of each finish selected on the substrate specified.

D. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located. Design calculations shall state that the walkway cover system design complies with the wind requirements of ASCE 7, the stability criteria of applicable building code, and all other governing criteria.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least ten years experience in the design, fabrication, and erection of extruded aluminum walkway cover systems.

B. Installer Qualifications: Have walkway covers installed by manufacturer, third party installation is not acceptable.

PART 2 PRODUCT

2.01 MANUFACTURERS

A. The design is based on products fabricated by: Peachtree Protective Covers, Inc., 1477 Rosedale Drive, Hiram, GA 30141, 770-439-2120, fax 770-439-2122.
1. Comparable products by the following manufacturers also will be acceptable:
a. Dittmer Architectural Aluminum.
b. Avadek Walkway Cover Systems.
2. Substitutions: Comparable products of other manufacturers will be considered under standard substitution procedures.

2.02 MATERIALS

A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.

B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.

C. Protective Coating for Aluminum Columns Embedded in Concrete: Clear acrylic.

D. Grout:
1. Portland Cement: ASTM C 150, Type I.
2. Sand: ASTM C 404.
3. Water: Potable.

E. Gaskets: Dry seal santoprene pressure type.

F. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040 inch, minimum.

2.03 MIXES

A. Grout: 1 part portland cement to 3 parts sand, add water to produce a pouring consistency.

2.04 FABRICATION

A. General:
1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
2. Welding: In accordance with ANSI/AWS D1.2.
3. Bent Construction: Factory assemble beams to columns to form one-piece rigid bents. Where used make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints can be used if supported by engineering calculations and/or testing.
4. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Assemble deck with sufficient camber to offset dead load deflection.

B. Columns: Provide radius-cornered tubular extrusions with cutout and internal diverter for drainage where indicated. Circular downspout opening in column not acceptable.

C. Beams: Provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.

D. Deck: Extruded self-flashing sections interlocking into a composite unit. Provide welded plate closures at deck ends.

E. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.

F. Arches: For barrel vault protective covers, provide sharp-cornered tubular extrusions.

H. Factory Finishing: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.

1. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.7 mils or thicker), complying with AAMA 611.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.02 ERECTION

A. Erect protective cover true to line, level, and plumb. Protect aluminum columns embedded in concrete with clear acrylic. Fill downspout columns with grout to the discharge level to prevent standing water. Install weep holes at top of concrete in non-draining columns to remove condensation.
B. Provide hairline miters and fitted joints.

3.03 CLEANING

A. Clean all protective cover components promptly after installation.

3.04 PROTECTION

A. Protect materials during and after installation.

END OF SECTION 10 73 00

SECTION 10 7301
ALUMINUM WALL HUNG CANOPY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Design, fabrication, and installation of welded extruded aluminum canopy systems.

1.02 REFERENCES

A. The Aluminum Association (AA):
   1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American Society of Civil Engineers (ASCE):
   1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.

D. American Society for Testing and Materials (ASTM):
   1. ASTM B 209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.
   2. ASTM B 221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM C 150, Specification for Portland Cement.
   4. ASTM C 404, Specification for Aggregates for Masonry Grout.

E. American Welding Society (AWS):
   1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design Walkways in accordance with The Aluminum Design Manual 2000.
   2. Comply with the wind requirements of ASCE 7.
   3. Provide an all welded extruded aluminum canopy system complete with internal drainage. Non-welded systems are not acceptable.
   4. Provide expansion joints to accommodate temperature changes of 120 degrees F. Provide expansion joints with no metal to metal contact.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product information, specifications, and installation instructions for canopy components and accessories.

B. Shop Drawings: Include plan dimensions, elevations, and details.

C. Samples:
1. Selection: Manufacturer's standard range of colors for the finishes selected.
2. Verification: 2-inch-square samples of each finish selected on the substrate specified.

D. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located. Design calculations shall state that the canopy system design complies with the wind requirements of ASCE 7, the stability criteria of applicable building code, and all other governing criteria.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least ten years of experience in the design, fabrication, and erection of extruded aluminum canopy systems.

B. Installer Qualifications: Have canopy installed by manufacturer, third party installation is not acceptable.

PART 2 PRODUCT

2.01 MANUFACTURERS

A. The design is based on products fabricated by: Peachtree Protective Covers, Inc., 1477 Rosedale Drive, Hiram, GA 30141, 770-439-2120, fax 770-439-2122.
1. Comparable products by the following manufacturers also will be acceptable:
a. Dittmer Architectural Aluminum.
b. Avadek Walkway Cover Systems.
2. Substitutions: Comparable products of other manufacturers will be considered under standard substitution procedures.

2.02 MATERIALS

A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.

B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.

C. Protective Coating for Aluminum Columns Embedded in Concrete: Clear acrylic.

D. Gaskets: Dry seal santoprene pressure type.

E. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040 inch, minimum.

2.04 FABRICATION

A. General:
   1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
   2. Welding: In accordance with ANSI/AWS D1.2.
   3. Gutter Frame Construction: Factory assemble gutter fascia frames to form a one-piece welded frame. Make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Gutter frames constructed by mechanically fastening components together are not acceptable.
   4. Deck Construction: Fabricate from extruded modules that interlock in a self-flashing manner. Positively fasten interlocking joints creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each.

B. Beams: Where applicable provide open-top tubular extrusion, top edges thickened for strength and designed to receive deck members in self-flashing manner.

C. Deck: Extruded self-flashing sections interlocking into a composite unit.

D. Gutter Fascia: Where applicable provide “j-shaped” gutter fascia capable in manufacturer’s standard sizes.

E. Fascia: Where applicable provide manufacturer’s standard fascia in standard sizes.

F. Hanger Assemblies: Provide extruded aluminum hanger rods in manufacturer’s standard shapes and sized to meet the loads seen by canopy.

SELECT ONE OF THE FINISH(S) BELOW. IF MORE THAN ONE FINISH IS SELECTED, THEN KEY FINISHES TO THE DRAWINGS. IF COLOR SELECTIONS ARE INCLUDED HERE, DELETE SELECTIONS SAMPLES FROM SUBMITTALS ARTICLE.

H. Factory Finishing: Finish designations prefixed by AA comply with system established by the AAMA for designating aluminum finishes.

   1. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.7 mils or thicker), complying with AAMA 611

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.02 ERECTION

A. Erect canopy true to line, level, and plumb.
B. Provide hairline miters and fitted joints.

3.03 CLEANING

A. Clean all canopy components promptly after installation.

3.04 PROTECTION

A. Protect materials during and after installation.

END OF SECTION 10 7301

SECTION 107316

CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes: Design, fabrication and erection of manufactured exterior canopies, including support framing, anchorage devices, connection hardware and related accessories. Exterior canopy designs include the following:

1. Suspended louvered sunshade canopies; wall supported cantilevered outrigger type with rod hangers.

B. Related work specified elsewhere includes:

1. Division 3 Section – "Cast-In-Place Concrete."
2. Division 5 Section - "Metal Fabrications."
3. Division 6 Section - "Rough Carpentry."
4. Division 7 Section - "Flashing and Sheet Metal."
5. Division 7 Section - "Joint Sealants."

1.3 DESIGN AND PERFORMANCE REQUIREMENTS:

A. System Design and Performance Requirements: Design, fabricate, and install exterior canopies to withstand loads from gravity, wind, snow, ponding, drift, seismic, and structural movement, including thermally induced movement; and to resist, without failure, other conditions of in-service use, including exposure to weather.

B. Structural Performance: Provide exterior canopies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Design Loads: Design canopies, including connections and anchorages, to withstand dead load, live load, wind load, snow load, seismic load and other applicable loading requirements complying with the International Building Code, 2012 edition with State of Georgia amendments.
2. Wind Speed at Project Site: As indicated on Structural Drawings.
3. Maximum Allowable Deflection:
    a. Framing Members: L/180 under full loading.
    b. Decking: L/120 under full loading.

C. Seismic Performance: Provide canopies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and

Other Structures," and as otherwise require by applicable codes and/or authorities having jurisdiction.

D. Thermal Movements: Provide canopies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

E. Water Drainage Provisions:

1. Walkway canopy designs shall incorporate internal drainage systems concealed in fascias, beams and columns to remove water from roof surfaces and discharged at ground level or to underground storm drainage piping system where indicated.
2. Suspended canopy designs shall incorporate internal drainage systems concealed in fascias or beams to remove water from roof surfaces and discharge through outlets or scuppers in fascia framing members.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's complete and current product specifications, standard details, certified product test results, installation instructions, and general recommendations, as applicable to materials and finishes for each component and for walkway canopy system.

B. Samples:

1. Finish Selection: Submit manufacturers color samples for each finished component of canopy for selection by Architect.
2. Fascia: Submit minimum 6-inch square sample of actual fascia materials in specified finish indicating selected color and texture to be expected in completed work.
3. Roof Panel: Submit 12-inches length by actual panel width sample indicating profile, style and finish.

C. Shop Drawings: Include dimensioned plans and elevations with sections and details indicating materials, metal thickness, panels, drainage system, framing components and finishes.

1. Show layout of structural support system and canopy roof panels.
2. Include fabrication and installation details indicating anchorage and connection methods, provisions for thermal and structural movement, splices, fasteners, reinforcement, and erection accessories.
3. Include details of edge conditions, joints, corners, panel profiles, miscellaneous supports, anchorages, trim, flashings, closures, and any other special details required.
4. Distinguish between factory and field assembly work.
5. Indicate compliance with specified performance and design requirements.

6. Indicate relationship with adjacent construction.
7. Shop drawings shall bear manufacturer's qualified professional engineer's current, signed and dated registration seal.

D. Structural Analysis: Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation indicating compliance with specified design and performance requirements.
1. Indicate grade or alloy and temper of material required and calculated deflection for design loads specified.
2. Submit structural analysis for Architect's information only.

E. Certification: Submit letter of compliance certifying that the proposed canopy design and layout meets or exceeds all applicable loadings (including wind load, rain live load, dead load, snow load) for the job location complying with governing code and ASCE 7.

F. Qualification Data: Submit for installer, fabricator and professional engineer to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements.

G. Welding Certificates: Submit copies of certificates for welding procedures and personnel.

1.5 QUALITY ASSURANCE:

A. Fabricator Qualifications: Manufacturer shall have minimum five (5) years experience in the successful design and fabrication of exterior metal canopies of similar material, design and construction with capabilities of providing specified engineering analysis required for work described in this section.
1. Manufacturer shall have completed fabrication of at least ten (10) verifiable canopy installations over the past five (5) years, that employs experienced and skilled workers who custom-fabricate products similar to those required for this Project with a record of successful in-service performance.
2. If requested by Architect, submit project listings, references indicating architect and owner with contact information for work completed within the period specified.

B. Installer Qualifications: Installer shall be approved by the canopy manufacturer and shall have a minimum of Five (5) years successful experience installing canopies of similar complexity and design with a record of successful in-service performance.
1. Installer shall have completed at least ten (10) verifiable canopy installations over the past five (5) years comparable to those indicated for the Project.
2. Superintendents and foremen, or other individual in supervisory position for any portion of the Work under this Contract shall have no less than 10-years verifiable experience in performing the type of work they are responsible for

C. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal canopies similar to this Project in material, design, and extent and that have a record of successful in-service performance.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

E. Source Limitations: Obtain canopies from a single manufacturer and through one source.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver panels and other components so they will not be damaged or deformed. Package extruded components and roof panels for protection against transportation damage.

B. Exercise care in unloading, storing, and erecting support system, panels and other system components to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering.

1. Store metal panels so that they will not accumulate water.
2. Do not store panels or other system components in contact with other materials that might cause staining, denting, or other surface damage.

D. Deliver accessories which are to be installed by other trades or in conjunction with the work of other trades, far enough in advance so as not to delay the Work on the project.

1.7 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with walkway canopy system work when existing and forecasted weather conditions permit work to be performed according to manufacturers' current written instructions, recommendations and warranty requirements.

B. Substrate Conditions: Do not begin roof panel installation until substrates have been inspected and are determined to be in satisfactory condition.

C. Field Measurements: Where possible, prior to fabrication of walkway canopy system and panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

1.8 WARRANTIES:

A. Warranty: The manufacturer and installer shall jointly and severably, in writing, warrant that the walkway canopy system shall remain intact (without perceptible deformation) and completely leak free for a period of Ten (10) years from the date of acceptance of the project (this warranty need not cover damage from winds exceeding the velocities and loading required by the governing code as generated by a design velocity based on the 100-year probability wind speed).

1. Repairs that become necessary, such as for leaks, wind damage or temperature stress while walkway canopy system is under warranty, shall be performed by the installer or manufacturer within 7-days of notification.
2. Should for any reason, the installer not be able to perform the repairs, it shall be incumbent upon the manufacturer to do so. If repairs are not begun on time, Owner shall have work done by others and costs will be charged to the Contractor, with no detrimental effect or cancellation of the warranty resulting from same.

B. This warranty shall be in addition to, shall be in effect simultaneously with, and shall not alter other required project or product warranties or guarantees, and shall not limit other remedies available to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with specified requirements:
1. Dittmer Architectural Aluminum.
2. Peachtree Protective Covers, Inc.
3. Perfection Architectural Systems, Inc.
4. Superior Mason Products, LLC.

2.2 MATERIALS:

A. Aluminum Materials: Alloy, temper and thickness as recommended by manufacturer for type of use and finish indicated and as required by engineer's structural analysis to meet specified design requirements.
1. Extruded Shapes, Tubes, Bars and Rods: Meeting ASTM B221.
2. Sheets and Plates: Meeting ASTM B209.
3. Welding Rods and Bare Electrodes: Complying with AWS A5.10.

B. Bolts and Anchors: Series 300 stainless steel of type, grade, class and sizes as recommended by manufacturer and indicated on shop drawings; compatible with material being anchored and capable of withstanding design loads to provide required connections.

C. Fasteners: Provide self-tapping, stainless steel fasteners compatible with material being fastened; type, grade, class and sizes as recommended by manufacturer and indicated on shop drawings.
1. Fasteners and anchors shall be capable of withstanding design loads and provide attachment required for securing canopy components in place.
2. Where exposed fasteners are required, provide with heads matching color of canopy finish by means of plastic caps or factory-applied coating. Countersink exposed fasteners and finish to match adjacent material.
3. Provide metal-backed neoprene washers under heads of fasteners located on weather side of canopy panels concealed from view.

D. Closures: Precut closures as standard with walkway canopy manufacturer, fabricated from same metal as that receiving closures, or from gray cross-linked closed-cell polyethylene composition foam, to the exact profile of the members with which it is to mate with.

E. Sealants:
1. Perimeter Sealants: As recommended in writing by walkway canopy manufacturer, or if not recommended by walkway canopy manufacturer, as specified in Division 7 Section "Joint Sealants."
2. Concealed Sealants: Non-skinning, non-hardening, non-oxidizing butyl sealant, designed for metal-to-metal concealed joints. Field applied adhesive tape sealants

shall be extruded polymeric butyl tape, non-skinning. Use no exposed sealants. Comply with minimum installation requirements of sealant manufacturer and Division 7 Section "Joint Sealants."

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187 and approved for the intended use by canopy manufacturer.

G. Grout: Minimum 2000 psi compressive strength.
1. Materials:
a. Portland cement: Meeting ASTM C150.
b. Masonry sand: Clean, hard, natural, washed sand or manufactured sand meeting ASTM C404.
2. Proportions: One part portland cement to three parts masonry sand; mixed with water to pourable consistency to achieve specified compressive strength.

H. Non-Metallic Shrinkage-Resistant Grout:
1. Acceptable Products; subject to compliance with specified requirements:
a. BASF Corporation; MasterFlow 713.
b. Euclid Chemical Company; Euco N.S.
c. L & M Construction Chemicals; Crystex.
d. U.S. Grout Corp.; Five Star Grout.
2. Characteristics: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C 1107 and CRD-621.

I. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound designed for exterior applications.
1. Water-Resistant Product: Product shall be of formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.
2. Compressive Strength: 7000 psi, minimum, at 28-days when tested according to ASTM C109.

2.3 SUSPENDED SUNSHADE CANOPIES:

A. Sunshade Canopy Design: Suspended, wall supported, cantilevered outrigger design with rod hangers and louver blades; welded extruded aluminum construction.

B. Canopy Size and Configuration: As indicated on drawings.

C. Canopy Components:
1. Outriggers and Frames: Manufacturer's extruded aluminum sections in shapes, profiles, sizes and material thickness required by engineer's analysis and design indicated on shop drawings.
2. Louver Blades: Manufacturer's extruded or formed aluminum sections in shapes, profiles, sizes and material thickness as indicated on shop drawings.

3. Fascia: Manufacturer's extruded aluminum sections in shapes, sizes and material thickness as indicated on shop drawings.
4. Hanger Assemblies: Manufacturer's extruded aluminum hanger rods in shapes and sizes required by engineer's analysis and design. Include brackets and related anchor devices to support hanger rods.

2.4 FINISHES:

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Aluminum Finishes:
1. Exposed Aluminum Components: Clear anodized coating complying with AAMA 611; AA-M12C22A41, Class I, minimum 0.70 mils (0.018 mm) coating thickness.
2. Concealed aluminum components: Mill finish.

C. Coating Application: Apply coatings either before or after forming and fabricating components, and after fabrication of extrusions, as required by coating process and as required for maximum coating performance capability.

D. Finish Protection: Protect coating either by application of strippable film or by packing plastic film or other suitable material between panels, extrusions and other components in a manner to protect the finish.

2.5 FABRICATION:

A. Manufacturer shall be responsible for design and fabrication of entire exterior canopy systems of type specified, including connections and related anchorage components.

B. Fabricate exterior canopies according to final reviewed and accepted shop drawings. Shop fabricate components to greatest extent practicable to minimize field splicing and fastening. Perform fabrication work prior to anodizing.

C. Fabricate walkway canopy beams and columns factory welded into one-piece rigid bents.

D. Construct suspended canopies with welded and bolted connections as indicated on shop drawings.

E. Factory assemble gutter fascias to form a one-piece welded frame. Field welding is not permitted. Construction of gutter fascias and framing component assembled using mechanical fasteners are not acceptable.

F. Perform welding according to AWS standards. Weld components prior to finishing to greatest extent possible.
1. Continuous weld components to fuse without undercut, overlap, or distortion of material and without defacing exposed finish.
2. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
3. Grind exposed welds smooth and flush, matching and blending with adjacent contours and surface textures without weakening base metal.

G. Form work true to line and level with accurate angles and surfaces and straight sharp edges.
   1. Form profiles without waves or buckling in metal surfaces.
   2. Ease exposed edges to radius of approximately 1/32-inch.
   3. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

H. Reinforce aluminum work at anchorage and support points, at joints and at attachment points for interfacing work.

I. Provide weep holes in fabricated components, positioned in inconspicuous locations not exposed to view, allowing for water, condensation and moisture collected within system to drain to exterior.

J. Fabricate canopy components with provisions allowing for thermal movement of materials.

K. Fabricate tubular framing members with end closures where exposed to view. Weld end closure caps to tubular framing, ground smooth and flush to provide neat, uniform appearance.

L. Fabricate decks from extrusions designed to interlock in a self-flashing manner. Fasten interlocking joints together to create monolithic structural unit capable of developing full strength of sections according to manufacturer's assembly procedures.

M. Assemble sunshade canopies with equal spacing of louver blades to maintain uniform appearance.

N. Protect components from galvanic corrosion.
   1. Apply bituminous coating or other permanent separation materials on concealed aluminum surfaces where components would otherwise be in direct contact with substrate materials that are noncompatible or could result in corrosion or deterioration of either material or finishes.
   2. Where aluminum will come in contact with concrete or masonry when installed, apply clear acrylic protection or bituminous paint protection to contact surfaces.

O. Upon completion of fabrication, preassemble components in factory to ensure proper fitting of work.
   1. Disassemble components to extent necessary for shipping and handling limitations.
   2. Mark components for assembly in accord with indications on shop drawings to identify location and positions for installation at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Installer shall examine all substrates and verify that conditions are acceptable for installation of canopy system.
   1. Verify that substrates are clean and free of all debris or other substance detrimental to the walkway canopy system work.

2. Verify location and alignment of preset anchors. Report deviations and proposed method for correction prior to proceeding.
3. Notify Contractor and Architect in writing of conditions requiring corrections, for proper completion of the Work.
4. Do not proceed until unsatisfactory conditions have been satisfactorily completed.

B. Beginning of work shall be acknowledgement that conditions are acceptable to receive installation of canopy system.

3.2 PREPARATION:

A. Inserts and Anchorage: Furnish inserts and anchoring devices which must be preset in concrete on timely basis to avoid delay in work. Set at locations indicated on final reviewed shop drawings.

B. Coordinate setting drawings, diagrams, templates and instructions for installation of concrete inserts, anchor bolts and miscellaneous items having integral anchors cast in concrete construction.

3.3 INSTALLATION:

A. Comply with manufacturer's written instructions and final reviewed shop drawings for installation.
1. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement.
2. Field cutting of panels and any other component by torch is not permitted.
3. Exercise care in handling, fitting and erecting components to prevent from scratching.

B. Provide anchorage devices and fasteners for securing items to in-place construction, including threaded fasteners for concrete insets. Anchor bolts and erection bolts shall be of types and sizes indicated on approved shop drawings.

C. Coordinate footing requirements with concrete work. Provide minimum 3000 psi concrete footings with block-outs of size, depth and shape required by canopy manufacturer for erection and setting of columns.
1. Reinforce footings as required to meet structural requirements.
2. Form and finish top of footings level with the top of sidewalk to insure proper drainage.

D. Set work in location, alignment and elevation, plumb and level within specified tolerances, true and free of rack; measured from established lines and levels. Install work in compliance with final reviewed shop drawings.
1. Set columns in prepared openings of concrete footings for grouting.
2. Columns and beams shall be aligned before columns are grouted.

E. Provide temporary supports and bracings required to maintain position, stability and alignment until permanent anchors and connections have been installed.

F. Protect components from contact with dissimilar materials by separating with concealed neoprene gaskets or bituminous coating. Protect finishes from damage or scratching during installation.

G. Provide connections as indicated on shop drawings. Isolate dissimilar metals using galvanic separators.

H. Install water-tight flashing and counterflashings at all locations where canopy system abuts buildings.

I. Downspout columns shall be filled with grout to the drainage hole to prevent standing water. Downspout deflectors shall be installed after grouting.

J. Deck butt joints shall have extruded fitted rain caps at least 6-inches long and full depth of deck at sides.

K. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of walkway canopy panel systems and accessories. Provide types of gaskets, sealants, and fillers indicated or, if not otherwise indicated, types recommended by walkway canopy manufacturer.

1. Flash and seal panels to exclude weather.
2. Counter flash over otherwise exposed flashings with metal and finish to match adjacent metal.
3. Refer to other sections of these specifications for product and installation requirements applicable to indicated joint sealers.

L. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4-inch in 20'-0", level, plumb, at required slope and location as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTION:

A. Damaged Units: Replace panels and other components of the work that have been damaged or have deteriorated beyond successful repair by means of finish touch-up or similar minor repair procedures, as determined by the Architect.

B. Cleaning: Remove temporary protective coverings and strippable films as soon as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended in writing by walkway canopy system manufacturer, and maintain in a clean condition during construction.

C. Final Cleaning: Just prior to Date of Substantial Completion, clean entire canopy assembly, using pre-tested detergent and water. Flush with clean water. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

END OF CANOPIES

SECTION 104400

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. Section Includes:

1. Portable Fire extinguishers.
2. Fire extinguisher cabinets, factory finished.

B. Related work specified elsewhere includes:

1. Division 1 Section – "Temporary Facilities."
2. Division 4 Section – "Unit Masonry."
3. Division 6 Section – "Miscellaneous Rough Carpentry".
4. Division 9 Section – "Gypsum Board Assemblies."
5. Division 9 Section – "Painting."

1.3 SUBMITTALS:

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Shop Drawings: Indicate extinguisher and cabinet sizes, mounting heights and method of installation. Include cabinet installation details.

C. Finish Samples: Where color selections by Architect are required, include color charts showing full range of manufacturer’s standard colors and designs available.

1.4 QUALITY ASSURANCE:

A. Single-Source Limitations:

1. Obtain fire extinguishers through one source and from a single manufacturer.

2. Obtain fire extinguishers, cabinets, and brackets from a single manufacturer and from one source.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

C. Fire Extinguisher Listing and Labels: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

D. Inspection Service:

1. Fire extinguishers shall include an inspection certification tag attached, indicating date of charge, servicing agent's name and address. Charge date shall have not been more than sixty (60) days prior to Date of Substantial Completion.
2. Servicing agent shall be located within 50 miles of the Project.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS:

A. Acceptable Manufacturers; subject to compliance with specified requirements:

1. Amerex Corp.
2. Fire End & Croker Corporation.
3. J.L. Industries / Activar Corporation Products, Inc.
4. Larsen’s Manufacturing Company.
5. Modern Metal Products/Div. Technico, Inc.
6. Potter Roemer - Fire Pro / Div. Morris Group International.

B. Multi-Purpose Dry-Chemical Type: Meeting UL 299 standard.

1. Classification: Classified for use on Class A, B and C fires.
2. Rating: UL-rated 4-A:80-B:C.
3. Capacity: 10-lbs. nominal capacity.
4. Container: Manufacturer's standard heavy duty steel cylinder with impact resistant polyester/epoxy paint finish.
5. Operation: Pull-pin with squeeze grip handle operation for variable controlled release.
6. Accessories: Equip with pressure gauge, hose and nozzle.

2.2 FIRE EXTINGUISHER CABINETS:

A. Acceptable Products; subject to compliance with specified requirements:

1. Fire End & Croker Corporation; 1600 Series.
2. J.L. Industries, Inc.; Ambassador Series.
3. Larsen's Manufacturing Company; Architectural Series.

4. Modern Metal Products/Div. Technico, Inc.; 100 Series.
5. Potter Roemer - Fire Pro / Div. Morris Group International.; Alta 7000 Series.

B. Type: Semi-recessed cabinet.

1. Door:
   a. Style: Duo-vertical panel.
   b. Material and Construction: Minimum 20-gauge (0.0359-inch) thickness cold-rolled steel; rolled-formed, one-piece tubular construction.
   c. Finish: Manufacturer's baked enamel coating acceptable for field painting.
   d. Glazing: Provide clear transparent acrylic sheet for duo-vertical panel door style.
2. Trim:
   a. Style: Rolled-edge; 2-1/2-inch backbend depth.
   b. Material and Construction: Minimum 20-gauge (0.0359-inch) thickness, cold-rolled steel; rolled-formed, one-piece tubular construction.
   c. Finish: Same as specified for door.
3. Cabinet Case: Minimum 20-gauge (0.0359-inch) thickness cold-rolled steel, one-piece formed construction; factory finished in manufacturer's standard white baked enamel coating.
4. Cabinet Size: Nominal 24-inch height by 10-inch width by 6-inch depth for full semi-recessed installation to 4-inch depth.
5. Hardware:
   a. Hinge: Manufacturer's full length continuous hinge of same material and finish as trim, capable of 180-degrees swing.
   b. Door Pull and Catch: Manufacturer's standard pull handle with roller catch.
   c. Door Lock: Manufacturer's keyed, vandal-resistant, cam lock that allows door to be opened during emergency by pulling sharply on door handle. Provide with all locks for cabinets keyed alike.

2.3 ACCESSORIES:

A. Mounting Brackets: Manufacturer's standard wall mounted steel bracket designed to support extinguishers secured in vertical position on wall or centered in cabinets. Provide in sizes and capacities required for specified extinguishers with plated or baked enamel finish.

B. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.

1. Extinguisher Cabinets: Provide die-cut vinyl, self-adhering, pre-spaced lettering reading "FIRE EXTINGUISHER", in size and color as selected by Architect; vertical orientation. Supply lettering loose for application following field painting of cabinets.

2. Bracket-Mounted Extinguishers: Identify with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine roughing-in for cabinets to verify actual locations and dimensions of rough openings before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets are to be installed.

C. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

C. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer’s instructions.

D. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer’s instructions.

1. Anchor to wall construction using minimum two anchors each; located top and bottom, interior of cabinet and concealed when doors are closed.
2. Anchors shall be of type and size recommended by cabinet manufacturer for substrates encountered, with exposed heads finished to match cabinet interior.

E. Install fire extinguisher cabinets and mounting brackets at heights as follows:

1. Fire Extinguisher Cabinets: 4'-0" A.F.F. to horizontal centerline of door handle.
2. Fire Extinguisher Mounting Brackets: 4'-0" A.F.F. to horizontal centerline of bracket release mechanism.

F. Comply with the requirements of NFPA 10 for location of fire extinguishers and to authorities having jurisdiction, if not otherwise shown on drawings. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

G. Install multi-purpose dry-chemical type extinguishers to cabinets located throughout facility and at other locations bracket mounted to wall construction.

H. Install portable fire extinguishers to locations at Date of Substantial Completion. Each extinguisher shall be attached with an inspection certification tag indicating acceptable charge pressure, date of charge and servicing agent.

END OF FIRE PROTECTION SPECIALTIES

SECTION 116653

GYMNASIUM DIVIDERS

GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fold-up divider systems.
   2. Electric operators.
   3. Divider curtains.
   4. Divider system accessories.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For gymnasium dividers.

   1. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each item and color specified.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans with divider-curtain layouts, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

B. Product Certificates: For each type of gymnasium divider.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Source limitation: All components including curtain, suspension system, electric winches, and controls for divider shall be products of a single manufacturer.

SECTION 116623

GYMNASIUM EQUIPMENT GENERAL

1.1 SUMMARY

A. Section Includes:

1. Basketball equipment.
2. Volleyball equipment.
3. Pickleball equipment.
4. Safety pads.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For gymnasium equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each item and color specified.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Court layout plans, reflected ceiling plans, and other details, drawn to scale, and coordinated with ceiling-suspended gymnasium equipment, floor inserts, game lines, and markers applied to finished flooring, and coordinated with each other, using input from installers of the items involved.

B. Product Certificates: For each type of gymnasium equipment.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment 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. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 BASKETBALL EQUIPMENT

A. MANUFACTURERS
1. AALCO Manufacturing
2. Draper, Inc
3. Porter Athletic Equipment Company
4. Or equal

B. Standard Rules: Provide equipment according to the requirements of NFHS's "Basketball Rules Book.

C. Connections: Manufacturer's standard connections or connections recommended in writing by manufacturer and complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.

D. Overhead-Supported Backstops:
1. Folding Type: Manufacturer's standard assembly for forward-folding, rear-braced backstop, with hardware and fittings to permit folding.
2. Goal Height Adjuster: Adjustable from 8 to 10 feet (2.40 to 3.05 m) to top of ring with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.

a. Operation:
1) Electrical: Electric operation with integral gear-drive motor, with limit switches preset to goal heights and the following:

E. Backstop Safety Device: Designed to limit free fall if support cable, chains, pulleys, fittings, winch, or related components fail.

F. Winch: Hoist consisting of heavy-duty, fully enclosed worm-gear; brake; cable drum; cable; and fittings, for mounting on wall with equipment-mounting board; designed to move and hold backboard in any raised or lowered position.

G. Backstop Electric Operator: Provide operating machine of size and capacity recommended in writing by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Motor Electrical Characteristics:

    a. Horsepower: 3/4 hp.
    b. Voltage: 115 V ac, single phase, 60 hertz.

3. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for recessed mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.

    a. Keys: Provide one set of dual keys per station.

4. Limit Switches: Adjustable switches at each backstop, interlocked with motor controls and set to automatically stop backstop at fully retracted and fully lowered positions.

H. Basketball Backboards:

1. Shape and Size:

    a. Rectangular, 72 by 42 inches (1830 by 1070 mm) width by height, with rounded corners.

2. Backboard Material: Provide with predrilled holes or preset inserts for mounting goals, and as follows:

    a. Fiberglass: Minimum 1-1/2-inch- (38-mm-) thick.

        1) Rim-Restraining Device: According to NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.

    b. Steel: Single-piece, steel face sheet, minimum 0.1046-inch (2.7-mm) nominal thickness, with 1-1/2-inch- (38-mm-) deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to back side of backboard; with mounting slots for mounting backboard frame to backstop at standard mounting centers.
    c. Hardwood or Particleboard: Minimum 1-1/2-inch- (38-mm-) thick.
3. Finish: Manufacturer's standard factory-applied, white background.

I. Goal-Mounting Assembly: Compatible with goal, backboard, and backstop.

J. Basketball Goals: Basket ring complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.

1. Single-rim basket ring competition goal.
2. Double-rim basket ring.
3. Type:

a. Fixed: Non-movable.

4. Finish: Polyester powder-coat finish.

K. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit ring diameter, and as follows:

1. Cord: Made from white cotton.

L. Backboard Safety Pads: Designed for backboard thickness and extending continuously along bottom and up sides of backboard and over backstop as required by referenced standard rules.

1. Color: As selected by Architect from manufacturer's full range.

2.3 VOLLEYBALL EQUIPMENT

A. MANUFACTURERS
1. AALCO Manufacturing
2. Draper, Inc
3. Porter Athletic Equipment Company
4. Or equal

B. Standard Rules: Provide equipment according to the requirements of NFHS's "Volleyball Rules Book".

C. Floor Insert: Solid-brass floor plate and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, minimum length required, to securely anchor pipe sleeve in structural floor; with anchors designed for securing floor insert to floor substrate indicated; one per post standard.

1. Flush Floor Plate: Lockable, hinged access cover, designed to be flush with adjacent flooring. Provide two tool(s) for unlocking access covers.
.

D. Post Standards: Removable, adjustable-height, telescoping, paired volleyball post standards, as indicated on Drawings, designed for easy removal from permanently placed floor inserts.

1. Materials: Manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring.
2. Nominal Pipe or Tubing Diameter: 3-inch (76-mm) OD at base.
3. Finish: Manufacturer's standard factory-applied, polyester powder-coat finish.
4. Net Height Adjuster: Manufacturer's standard mechanism for height adjustment, complete with fittings; designed for positioning net at heights indicated.

a. Net Heights: Between sitting volleyball net height and boys'/men's volleyball net height, 36 and 95-5/8 inches (910 and 2430 mm) or more.

5. Height Markers: Clearly marked at regulation play heights for elementary school, girls/women, boys/men, and sitting volleyball.

E. Net: 32 feet (9.75 m) long; one per pair of paired post standards; and as follows:

1. Width and Nylon Mesh: Competition volleyball net, 36 inches (910 mm) with 4-inch- (102-mm-) square knotless mesh made of black nylon string.
2. Dowels: Minimum 1/2-inch- (13-mm-) diameter fiberglass or 1-inch- (25-mm-) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
3. Net Antennas: 3/8-inch- (9.5-mm-) diameter, high-tensile-strength, extruded-fiberglass or plastic rods, 72 inches (1830 mm) long, extending above top hem band of net, with alternating white and red bands according to referenced standard rules. Provide two antennas per net.
4. Boundary Tape Markers: 2-inch- (50-mm-) wide white strip, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.

F. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip, manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle.

G. Bottom Net Lock Tightener: Manufacturer's standard.

H. Judges' Stands: Manufacturer's standard adjustable-height units designed to be freestanding, folding for storage with wheels for transporting.

I. Safety Pads: Consisting of minimum 1-inch- (25-mm-) thick, multiple-impact-resistant manufacturer's standard foam filler covered by puncture- and tear-resistant fabric cover, manufacturer's standard; with fire-test-response characteristics indicated. Provide pads with hook-and-loop closure or attachments for the following components:

1. Post Standards: Wraparound style pads, designed to totally enclose each standard to a minimum height of 66 inches (1680 mm); one per post.
2. Net Lines: Four per net.
3. Judges' Stands: Pads designed to totally enclose front and sides.
4. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701.
5. Fabric Color: As selected by Architect from full range of industry standard colors and color densities.

J. Post Standard Transporter: Manufacturer's standard.

K. Wall Storage Rack: Manufacturer's standard.

L. Storage Cart: Manufacturer's standard.

2.4 SAFETY PADS

A. MANUFACTURERS
1. AALCO Manufacturing
2. Draper, Inc
3. Porter Athletic Equipment Company
4. Or equal

B. Surface-Burning Characteristics: Comply with ASTM E84; 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: 50 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, minimum 14-oz./sq. yd. (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated.

D. Wall Safety Pads: 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: Minimum 3/8-inch- (9.5-mm-) thick plywood, mat formed, or composite panel.
2. Fire-Resistive Fill: Multiple-impact-resistant foam minimum 2-inch- (50-mm-) thick, fire-resistive neoprene, 6.0-lb/cu. ft. (96-kg/cu. m) density.
3. Size: Each panel section of manufacturer's standard dimensions
4. Installation Method: Manufacturer's standard.
5. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for two color(s).

E. Corner Wall Safety Pads: Wall corner pad consisting of minimum 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to wall.

1. Length: Each pad minimum 72 inches (1830 mm).
2. Fabric Covering Color(s): Match color of wall safety pads for two color(s).

F. Column Safety Pads: Pads covering exposed flange of columns to height indicated, consisting of minimum 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to column.

1. Length: Each pad minimum 72 inches (1830 mm).
2. Fabric Covering Color(s): Match color of wall safety pads for two color(s).

G. Round Column Safety Pads: Wraparound pads fully covering exposed round column to height indicated, consisting of minimum 2-inch- (50-mm-) thick, multiple-impact-resistant, bonded

polyurethane-foam filler, 6.0-lb/cu. ft. (96-kg/cu. m) density, covered on both sides and all edges by fabric covering with hook-and-loop attachment to column.

1. Length: Each pad minimum 72 inches (1830 mm).
2. Fabric Covering Color(s): Match color of wall safety pads for two color(s).

H. Cutout Trim: Manufacturer's standard flanged cutout trim kits for fitting pads around switches, receptacles, and other obstructions.

1. Color: Black.

2.5 PICKLEBALL EQUIPMENT

A. MANUFACTURERS
1. FIRST TEAM
2. Or Approve Equal

B. Standard Rules: Provide equipment according to the requirements of THE USAPA's "The Official USA Pickleball Rulebook”

C. Floor Insert: FIRST TEAM, MODEL FT5001 - 3-1/2” OD Aluminum upright tubing. Stainless steel hinged cover. Powder coated chrome lid, lower ground socket shall be painted black. For indoor or outdoor use. Weights approximately 18 lbs. Solid-brass floor plate and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, minimum length required, to securely anchor pipe sleeve in structural floor; with anchors designed for securing floor insert to10 “ deep in the floor substrate indicated; one per post standard.

D. Post Standards: MODEL JAYPRO Manufacturer Part #PPR15BK and PPR15GR. Removable, adjustable-height, telescoping, paired pickleball post standards, as indicated on Drawings, designed for easy removal from permanently placed floor inserts.

1. Materials: Manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring.
2. Nominal Pipe or Tubing Diameter: 3-inch (76-mm) OD at base. For raising and controlling the tightness by using a Heavy Duty Self Locking Winch with Removable Handle.
3. Finish: Manufacturer's standard factory-applied, polyester powder-coat finish in black or green with a zinc undercoat.
4. Net Height : Manufacturer's standard mechanism for height placement, complete with fittings; designed for positioning net at heights indicated.

a. Net Heights: Sits with a pickleball net at a height of 36 inches net height.

E. Net: 22 feet (9.75 m) long; one per pair of paired post standards; and as follows:

1. Width and Nylon Mesh: FIRST TEAM DELUXE 3mm net for the competition pickleball net, 36 inches (910 mm) with 4-inch- (102-mm-) square knotless mesh made of black nylon string that is 3mm U.V. resistant mesh.
2. Dowels: Minimum 1/2-inch- (13-mm-) diameter fiberglass or 1-inch- (25-mm-) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
3. Boundary Tape Markers: 2-inch- (50-mm-) wide white strip, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.

F. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip, manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle.

G. Bottom Net Lock Tightener: Manufacturer's standard.

H. The FIRST TEAM DELUXE 3 mm Net with Double Top Stitching comes with a 5 year limited warranty.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions and competition rules for each type of gymnasium equipment.

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 relationship to adjacent construction; and aligned with court layout.

C. Connections: Connect electric operators to building electrical system.

D. Removable Gymnasium-Equipment Components: Assemble in place to verify that equipment and components are complete and in proper working order. Disassemble removable gymnasium equipment after assembled configuration is approved by Owner, and store units in location indicated on Drawings.

E. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

3.2 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

B. All welding to be performed by personnel having passed Welder Qualification testing in accordance with American Welding Society (AWS) code D1.1 or higher. Manufacturer to provide certification and test results upon request.

PART 2 - PRODUCTS

2.1 FOLD-UP DIVIDER SYSTEMS

A. Manufacturer:
1. Draper, Inc.
2. Jaypro Sports, LLC.
3. Porter Athletic Equipment Company

B. Divider-Curtain System: Electrically operated, upward folding, cable suspended, and as follows:

1. Top Hem: Double-thickness mesh or solid vinyl for continuous pipe batten.
2. Outer Edge Hems: Triple turned and welded.
3. Bottom Curtain Pocket: 6 inches with manufacturer's standard pipe batten with padding.
4. Support Cables: Galvanized-stranded-steel wire rope and fittings.
5. Support Chain and Fittings: Hardened alloy-steel chain rated for lifting loads indicated, with commercial-quality, corrosion-resistant steel connectors and hangers.
6. Curtain Battens and Drive Pipe: Steel pipe or tubing.

2.2 ELECTRIC OPERATORS

A. Provide factory-assembled electric operation system of size and capacity recommended in writing and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors and factory-prewired motor controls, control devices, and accessories required for proper operation.

1. Include wiring from control stations to motors and between synchronizer and dual motors for long curtains. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

B. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Motor Electrical Characteristics:

1. Horsepower: 3/4 hp.
2. Voltage: 115 V ac, single phase, 60 hertz.

D. Limit Switches: Adjustable switches at each divider curtain, interlocked with motor controls and set to automatically stop divider curtain at fully extended and fully retracted positions.

E. Control System:

1. Key-Switch Operation: NEMA ICS 6, Type 1 enclosure, momentary-contact, three-position switch-operated control with up, down, and off functions.

    a. Keys: Provide two key(s) per station.

2.3 DIVIDER CURTAINS

A. Upper Curtain, Mesh: Woven mesh of polyester yarn coated with vinyl, weighing not less than 9 oz./sq. yd.

1. Mesh Color: As selected by Architect from full range of industry colors and color densities.

B. Lower Curtain, Solid: Woven polyester fabric coated with vinyl, 18 oz./sq. yd., 8-foot height above floor.

1. Fabric Color(s): One color, as selected by Architect from full range of industry colors and color densities.

C. Hems: Folded and electronically welded.

D. Seams: Electronically welded.

E. Overall Curtain Height: Floor to ceiling, within installation clearances required.

F. Bottom of Curtain: Approximately 2 inches above finished floor.

2.4 DIVIDER SYSTEM ACCESSORIES

A. Safety Lock: Locks drive system when speed exceeds manufacturer's recommended speed.

B. Audible Motion Alarm: Provide alarm with intermittent warning tone when curtain is raised or lowered.

2.5 SUPPORT MATERIALS AND FASTENERS

A. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions.

B. Install gymnasium dividers 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 sport-court layout.

C. Connections: Connect electric operators to building electrical system.

D. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, uneven tension, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

E. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.2 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers.

END OF SECTION 116653

Pickleball Nets

FILTER AND SORT

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2 PRODUC

GAMMA 22' PORTABLE PICKLEBALL NET SET
$159.99

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PREMIER™ RD-36 HEAVY DUTY DOUGLAS PICKLEBALL POSTS

EXPLORE NSP'S HIGH-QUALITY PICKLEBALL POSTS & NETS

MADE IN THE USA FREE SHIPPING | *May require LTL Freight*

Ships in 2-3 Weeks

PREMIER™ RD

These popular posts are designed for pickleball court construction measuring 54" in length to sit 36" above ground. The Premier 3" OD round (RD) posts are constructed of heavy-duty 11-gauge steel. Read more

SKU: 63070Z

Color Choose an option

1 ADD TO CART

Description

These popular round posts provide classic good looks and durability for either indoor or outdoor pickleball court applications. The Premier round posts meet official USAPA Tournament Regulations.

Premier RD posts are an excellent choice for any pickleball facility including clubs, tournaments, and recreational courts.

QUICK SPECIFICATIONS

- 3" O.D. round heavy-duty 11-gauge steel
- Baked-on polyester powder coat finish.
- Choose from a black or green finish.
- Integrated welded steel lacing rods.
- Internal wind self-locking gear mechanism (https://nationalsportsproducts.com/product/premier-post-gears).
- Post caps are (https://nationalsportsproducts.com/product/premier-rd-caps) made of cast aluminum alloy.
- Chrome-plated gear plate cover.
- Removable handle (https://nationalsportsproducts.com/product/deluxe-chrome-handle) for safety and convenience.
- Sold per pair.
- Ground sleeves are recommended.
- For Indoor or outdoor use.

DIMENSIONS

The pickleball net posts measure 54" in length. Once the net posts are placed into the pre-installed ground sleeve the post sits 36" above the tennis court surface.

POST

The 3" O.D. round pickleball post is constructed from heavy-duty 11-gauge steel. Posts are finished with a black or green baked-on polyester powder coat to resist rust and increase durability. The post features integrated welded steel lacing rods for securing the net to the post. With Douglas pickleball court net posts, a base collar is placed at 36", which acts as a stop to ensure the net post is installed at the correct height when it's inserted into the ground sleeve.

HARDWARE

The Douglas® Premier™ post series are all internally wound featuring a self-locking gear mechanism that prevents recoiling during winding. The main gear is constructed of plated steel while the small gear is case-hardened. The internal gear function is a 30:1 ratio, ensuring smooth and easy operation. The gear housings and caps are made of cast aluminum alloy. The posts flush mounted gear plate cover and removable handle are chrome plated.

If at some point the hardware needs to be replaced, it can easily be removed from the net post and a new gear assembly can be inserted into the post. Replacement parts include: plated steel gear assembly (https://nationalsportsproducts.com/product/premier-post-gears), replacement tennis post caps (https://nationalsportsproducts.com/product/premier-rd-caps), and replacement chrome handle (https://nationalsportsproducts.com/product/deluxe-chrome-handle).

WARRANTY

5 Year Limited Warranty

Ground Sleeves

Corresponding 24" Steel Ground Sleeves (https://nationalsportsproducts.com/product/gs-24rdst-galvanized-steel-ground-sleeves-24-long-for-3-od-posts) are not included but can be purchased separately.

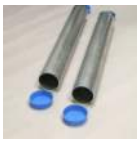
If you are constructing a new pickleball court, it's highly recommended to install ground sleeves in the concrete instead of directly installing the tennis posts in the concrete. In addition, if you live in an area that has winter months or periods in which you are unable to use the pickleball courts, you can remove the net posts and store them which will increase the lifetime of the pickleball posts. If at some point you need to replace the pickleball court posts, you can slide the old net posts out of the sleeve and slide a new pair directly into the sleeve.

Additional Info

Questions

(https://nationalsportsproducts.com/wp-content/uploads/2023/11/63032D.jpg)

Plated Steel Hardware | Steel Self Locking Gears | Cast Aluminum Alloy Caps | Integrated Welded Lacing Rods



GS-24RD/AL Aluminum Ground Sleeves 24" Long for 2-7/8" OD Posts

$69.00

(https://nationalsportsproducts.com/product/gs-24rdal-aluminum-ground-sleeves-24-long-for-2-78-od-posts)

SHOP NOW

Douglas® SW-36 Deluxe Pickleball Posts 2-7/8" OD

$579.00

(https://nationalsportsproducts.com/product/sw-36-deluxe-pickleball-posts-2-7-8-od)

SHOP NOW

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(https://nationalsportsproducts.com/product/premier-xs-36-pickleball-stainless-steel)

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GS-24RD/ST Galvanized Steel Ground Sleeves 24" Long for 3" OD Posts

$79.00

(https://nationalsportsproducts.com/product/gs-24rdst-galvanized-steel-ground-sleeves-24-long-for-3-od-posts)

SHOP NOW

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We have been a dealer for Douglas Industries for almost 40 years. We sell and install windscreens, tennis nets and many of their products. The quality and workmanship of their windscreens is second to none. Whether using polypropylene or vinyl coated polyester windscreens , we have very few problems. We have built a trust with them, in both the quality of the products, and their knowledgeable customer service. Everyone is friendly, courteous and helpful. We consider it a privilege to be a dealer for Douglas Industries.

- JEFF WISE, OWNER OF TEXAS COURTS & WINDSCREENS

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Email

SIGN UP

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- Soccer (https://nationalsportsproducts.com/product-category/soccer)
- Tennis (https://nationalsportsproducts.com/product-category/tennis)
- Volleyball (https://nationalsportsproducts.com/product-category/volleyball)

SHOP BY INDOOR SPORTS FACILITY
- Backdrop Curtains (/product-category/gymnasium-equipment/backdrop-curtains)
- Digital Graphics (/product-category/gymnasium-equipment/digital-graphics)
- Gym Divider Curtains (/product-category/gymnasium-equipment/gym-divider-curtains)
- Gym Floor Covers (/product-category/gymnasium-equipment/gym-floor-covers)
- Installation Accessories (/product-category/gymnasium-equipment/installation-accessories-gymnasium-equipment)
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SECTION 12 2414
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manually operated sunscreen roller shades.

1.02 RELATED SECTIONS

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

B. Section 06 1000 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

C. Section 09 2116 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

D. Section 09 5100 - Suspended Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.03 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.
   5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

E. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

F. Mock-Up: Provide a mock-up (for both manual and electrical shades) of one roller shade assembly for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window designated by Architect.
   2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.08 WARRANTY

A. Shade Fabric: Manufacturer's 10-year warranty.

B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

C. Roller Shade Hardware, and Chain: 5 years warranty against defects in materials and workmanship.

D. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Caco, Inc.

B. Draper, Inc.; "Access FlexShades" [Basis of Design]: www.draperinc.com.

C. Lutron: www.lutron.com.

D. MechoShade Systems, Inc. www.mechoshade.com.

E. Substitutions: Section 01 6000 - Product Requirements.

2.02 SHADE CLOTH

A. Light-Filtering Fabrics:
   1. SheerWeave Series SW2900 Series by Phifer: VOC Emissions: GREENGUARD and GREENGUARD Gold - certified as a low-emitting fabric. Composition: 38% Fiberglass, 62% Vinyl on Fiberglass. Fire rating: NFPA 101 (Class A Rating). Bacteria and Fungal Resistance: ASTM E 2180; ASTM G 21AATCC30 Part 3; ASTM D 3273; GREENGUARD Mold and Bacteria Standard ASTM 6329. Include Microban antimicrobial additives. Mesh Weight: 14.1 oz/sq yd. Openness Factor - Approx. 1 percent. UV Blockage - Approx. 95 Percent. Fabric thickness: 0.022 inches.

B. Color and Pattern: As selected by Architect from manufacturer's standard range.

2.03 MANUAL WINDOW SHADES

A. Type: Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation. Includes aluminum housing with

installation to be coordinated with ceiling system installation. Provide brackets, fasteners, and other components necessary for complete installation.

B. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
   1. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon.
   2. Bead chain loop: Stainless steel bead chain hanging at side of window.

C. Roller: Fabricated from extruded aluminum or steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade size. Provide with roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.

D. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.

E. Endcap covers to match fascia/headbox finish.

F. Shade slat: Slat encased in heat seamed hem.

G. Headbox Ceiling/Wall Style: Aluminum fabrication with removable closure, endcaps, and back and top cover piece:
   1. Finish: Powder coat color as selected by Architect.

H. Location: In Administrative Spaces. See Drawings.

2.04 ACCESSORIES

A. Roller Shade Pocket for recessed mounting in acoustical tile, or drywall ceilings where indicated on the Drawings.
   1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
      a. Provide "Vented Pocket" such that there will be a minimum of four 1 inch (25.4 mm) diameter holes per foot allowing the solar gain to flow above the ceiling line.

B. Fascia, where required for non-recessed mounting:
   1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
   2. Fascia shall be able to be installed across two or more shade bands in one piece.
   3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
   4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
   5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 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.

3.03 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.04 TESTING AND DEMONSTRATION

A. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.

B. Demonstrate operation of shades to Owner’s designated representatives.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3219
LAMINATE CASEWORK

PART 1 - GENERAL

1.01 SUMMARY

A. The General Contractor, at its option, may furnish and install Custom Architectural Woodwork (Millwork) in lieu of the Casework specified in this Section. See Section 06 4000 - Custom Architectural Woodwork for requirements.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.

B. Section 06 1000 - Rough Carpentry.

1.03 WORK INCLUDED

A. The extent of manufactured casework systems as shown on drawings, schedules, and specified herein. Where specific materials, finishes, construction details, and hardware are specified herein, the casework contractor shall be held in strict accordance. All items shall be as provided, and publicly cataloged, by the manufacturers to assure physical and dimensional integrity of the system and ready access to additional systems components for a minimum of ten (10) years after completion of this contract. Product from companies not meeting this requirement will not be accepted. It is the intent of the owner and architect and construction manager to have this specification section furnished by one contractor.

B. Furnish and install all fixed, modular, and mobile laminate clad casework, tops and accessories and components, fillers and related items shown on drawings and herein specified. All built-in and modular plastic laminate counter tops and splashes are specified herein and detailed on architectural.

C. Furnish and install all locks for cabinet doors and drawers as indicated on elevations of the architectural drawings.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain entrance mats, grates, and frames from a single manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing specified mats and grates with minimum three years documented experience.

C. Installer Qualifications: Company specializing in installing mats and grates with minimum three years documented experience and approved by carpet tile manufacturer.

D. Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux minimum 0.45 watts/ SM.

E. Slip Resistance: Per ASTM D 2047-96, Coefficient of Friction 0.60 when wet, or better.

1.05 RELATED WORK SPECIFIED ELSEWHERE

A. Division 6 - Coordination of all in-wall blocking.

B. Sinks and service fixtures, service and waste lines and all connections, vents, electrical service fixtures, hoods and ducting within or adjacent to casework, or otherwise required in all areas: Furnished and installed under Mechanical and Electrical Divisions 21 through 26.

C. Base molding: Furnished and installed under Finishes Division 9, to be consistent with base molding in room, unless base is not specified, in which case laminate base shall be applied.

D. Appliances, unless specifically noted on plans as included in this section.

E. Furnishing, installing and connecting of service supply lines and conduits within equipment and reagent racks, connecting of exposed service lines, connecting of services in tunnels or service turrets through, under, or along backs of working surfaces as required for utility service fixtures.

F. Installing all utility service outlet accessory fittings and fixtures furnished by casework contractor, pulling of wire and connecting of electrical fixtures in service lines, provision of ground fault protection for circuits requiring such.

G. Receiving, installing and connecting all separate sinks, cup sinks or drains, draining troughs, overflows and sink outlets, as furnished by the casework contractor for the Work Room and Storage Room areas.

H. Furnishing, installing and connecting all traps, tailpieces, backflow prevention devices and special plumbing fittings and piping of unusual nature to meet local codes even though not specifically called for in specifications or shown on drawings.

I. Furnishing and installing of all framing, bucks, metal grounds or reinforcements in walls, floors, ceilings to adequately support and anchor casework and related equipment.

J. Furnishing fluorescent tubes, light bulbs and any miscellaneous materials generally classified as maintenance or supply items.

K. Furnishing and installation of all rigid or flexible conduit, wire, pulling of wire, fittings, special electrical equipment, data, and accessories including boxes, receptacles, and flush plates required at reception desk.

L. Coordination with millwork items as specified in Section 06 4000 - "Architectural Woodwork".

1.06 SYSTEM DESCRIPTION

A. All manufactured casework shall be pre-engineered, and cataloged in a nationally published catalog. Manufacturers submitting for approval must provide printed catalog information documenting this performance feature; no exceptions will be allowed.

1.07 QUALITY ASSURANCE

A. All manufactured casework systems, countertops and related items herein specified shall be furnished by one contractor to insure single source responsibility, and integration with other building trades

B. All manufacturers herein listed, shall show evidence of a minimum of five (5) years experience in providing manufactured casework systems for similar types of projects.

C. Manufacturer shall produce evidence of adequate facilities and personnel required to perform on this project. Financial stability of manufacturer shall be evidenced by readily providing a material performance bond if required.

D. Manufactured casework systems must conform to design, quality of materials, workmanship and function as shown on drawings and specified herein. In the absence of a printed specification, minimum quality standards shall be in accordance with AWS Section 10 & Section 11, 1st Edition, Oct. 2009, no exceptions will be permitted; additional requirements shall be as specified herein.

E. Provide independent laboratory testing documenting that the support rail and interfacing components when tested in strict accordance with the requirements of seismic construction codes, all components met or exceeded the requirements as set forth by the codes. All casework bidders must provide a copy of test to architect ten days prior to bid date.

F. All casework bidders must provide the following test results as tested by an independent testing firm:
   1. Racking Test (must exceed 975 lbs.)
   2. Front Joint Load Test (must exceed 635lbs.)
   3. Uniform Load Shelf Test (must exceed 1140 lbs.)
   4. Isolated Shelf Clip Load Test (must exceed 640 lbs.)
   5. Static Load Test (must exceed 1800 lbs with no cabinet failure)
   6. Draw Side Joint Test (must exceed 425 lbs.)
   7. Draw Front Joint Test (must exceed 925lbs.)
   8. Draw Static Load Test (must exceed 900 lbs.)

G. The architect and owner reserves the right to randomly select one 36” wide base cabinet and one 36” wide wall cabinet and one 36” wide tall cabinet from each manufacturer during installation and cut apart to determine if the product installed meets the written specification. The casework manufacturer shall include the price to

replace these units in his bid. If the product fails to meet the specification then the casework supplier shall be responsible to make any and all necessary corrections.

1.08 SUBMITTALS

A. Product Data:
   1. In addition to the general conditions as relates to prior approvals, submittals of manufacturer's data, installation instructions, and samples are required upon architect's request.

B. Samples:
   1. Submit samples of specified decorative laminate colors, patterns, and textures for exposed and semi-exposed materials for architect's selection. See drawings.
   2. Submit samples of hardware.
   3. Architect may request representative full-size samples for evaluation prior to approval. Samples may be impounded by architect/owner until completion of project to ensure compliance with specifications.
   4. Submit copy of Seismic testing report.

C. Production Drawings:
   1. Submit production drawings for all casework systems and countertops and required equipment showing plans, elevations, ends, cross-sections, service run spaces and location of services.
   2. Include layout of units with relation to surrounding walls, doors, windows, and other building components. Include finish and hardware schedule.
   3. Coordinate production drawings with other work involved.

1.09 PRODUCT HANDLING

A. Deliver casework and countertops only after wet operations in building are completed.

B. Store completed casework and countertops in a ventilated place, protected from the weather, with relative humidity range of 20% to 50%.

C. Protect finished surfaces from soiling and damage during handling and installation.

D. General Contractor shall be responsible for protection of all casework and tops after installation is completed.

1.10 JOB CONDITIONS

A. Humidity and Temperature Controls:
   1. Before the delivery and installation of casework and equipment, building conditions shall be as follows:
      a. The building shall be secure and weather tight, with windows and doors installed, heat and air conditioning systems functional.
      b. Walls and openings shall be plumb, straight and square. Concrete floors shall be level within acceptable trade tolerances. Specifically the floor must be within 1/8" of level per 10 foot run, non-accumulative, when tested with a straight edge in any one direction.
      c. Flooring required to be placed under casework and equipment must be installed.
      d. Wood or metal blocking (wall grounds) shall be installed within partitions prior to delivery of casework and furnishings to allow for immediate installation on delivery.
      e. General Contractor shall have heat and air conditioning systems providing consistent temperature and humidity conditions as required Related humidity must be maintained at not less than 25%, nor more than 55%. Temperatures must not range lower than 65 degrees F, not to exceed 80 degrees F in areas of material installation.
      f. All overhead mechanical, electrical or plumbing rough-in work shall be complete
      g. Any “wet” operation performed by other trades must be complete prior to delivery.
      h. Ceiling grids (with or without ceiling tiles), overhead soffits, duct work and lighting shall be installed.
      i. Painting shall be complete.
      j. General Contractor shall provide a secure storage area within the building that is clean, dry well ventilated, protected from direct sunlight and broom clean.

1.11 WARRANTY

A. The manufacturer shall guarantee all materials and workmanship of equipment provided in this contract for a period of five years from date of final acceptance. This is a warranty of replacement and repair only, whereby the manufacturer will correct defects in materials and/or workmanship without charge. Any defective materials of faulty workmanship occurring within that time shall be replaced or corrected promptly without charge upon notification by the owner or his designated representative. All bidders are to provide to the Architect a copy of the manufacturers warranty for the casework ten (10) days before the bid date.

PART 2 – PRODUCTS

2.01 PLASTIC LAMINATE CASEWORK

A. Manufacturers: Subject to compliance with specifications, provide products by one of the following:
   1. Casework Systems:
      a. TMI Systems Design Corporation.
      b. Case Systems, Inc.
      c. LSI Corporation of America, Inc.
      d. Stevens Industries, Inc.
   2. Plastic Laminate: Provide products from manufacturers listed on Finish Legend.

B. Substitutions:
   1. It is the intent of this specification to establish performance and quality criteria consistent with pre-established standards of design and function herein described. Casework systems not meeting these minimum standards will not be accepted.
   2. Where specific materials, finish options, construction details, modularity, hardware and test data are specified herein, the casework storage system will be held in strict compliance. Substitutions will be considered prior to bid date provided request is submitted to the architect, in writing, no later than ten (10) days prior to bid date; substitution request shall list any and all deviations from this specification. Requests later than ten (10) days prior to bid will not be considered. Acceptable substitutions will be identified in future addenda.
   3. All manufacturers must submit the following items to the architect ten days prior to bid date to be qualified to bid.
      a. A Copy of required Seismic Testing Data related to rail casework.
      b. ADA Brochure depicting ADA requirements and compliance
      c. All required independent test reports.
      d. A sample base cabinet of fixed base cabinet with required hardware.
      e. A copy of Guarantee and Limited Warranty.
      f. A detailed deviation list addressing where the requested product deviates from the specified product.

2.02 MATERIALS

A. Core Materials:
   1. MR Moisture Resistant Medium Density Fiberboard: Average 47-pound density grade, ANSI A 208.2.
   2. Medium Density Fiberboard: Average 47-pound density grade, ANSI A 208.2.
   3. Grade AB Plywood

B. Hardboard: 1/4 inch thick prefinished hardboard, CS-251.

C. Decorative Laminates:
   1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-1995. for vertical surfaces.
   2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-1995 for horizontal Surfaces.
   3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-1995 for post formed tops.
   4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-1995.
   5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-1995.
   6. Thermally fused melamine laminate, NEMA Test LD 3-1995.

D. Laminate Color Selection: See Finish Legend for color selection.

E. Edging Materials:
1. 1 mm PVC banding.
2. 3mm PVC banding, machine profiled to 1/8 inch radius, where required and herein specified.
3. Finish: To be selected.

F. Grommets:
1. 2-1/2" x 6" rectangle grommet - equal to Mocket #RG3-P3. See Drawings for location.

2.03 SPECIALTY ITEMS

A. Metal Parts:
1. Countertop support brackets, undercounter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted. Color shall be as selected by Architect from manufacturer's standard colors.
a. Support brackets shall be equal to Rakks EH Counter Support Bracket unless otherwise noted.
1) For concealed support, provide Inside Wall-Flush Mount bracket.

2.04 CABINET HARDWARE

A. Hinges:
1. Furnish five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
2. Doors 48 inch and over in height shall have 3 hinges per door.
3. Provide a magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustments.

B. Pulls:
1. Wire pulls equivalent to Stanley No. 4484, stainless steel, satin finish (ANSI B12012), 4-inches long, with 1-inch clearance; finish to match Section 08710 - "Finish Hardware" finish in room(s) where occurs. Pull design shall comply with the Americans with Disability Act (ADA).

C. Drawer Slides:
1. Regular, knee space and pencil slides shall be 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and have a positive stop both directions with self-closing feature. Paper storage units shall have 150-pound load rated epoxy coated steel slides.
2. File: Full extension, Shall have 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers and have positive stop both directions with self-closing feature.

D. Adjustable Shelf Supports:
1. Injection molded transparent polycarbonate friction shall fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support shall have 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall automatically adapt to 3/4 inch or 1 inch thick shelving and provide a non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

E. Locks:
1. Shall be standard removable core, disc tumbler, cam style lock for drawer with strike. Furnish 2 keys.

F. Coat Rods: Shall be 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

G. File Suspension System: Shall be 14-gauge steel file suspension rails, epoxy powder coated. File followers, or other split bottom hardware, will not be acceptable.

2.05 FABRICATION

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. Cabinet Body Construction:
1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals.

2. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets.
3. Tops, bottoms and sides of all cabinets are 3/4 inch thick particleboard core.
4. Cabinet backs: 1/2 inch thick. Wall and tall cabinets are provided with a 1-inch x 1-3/4 inch PVC mounting strip used to secure the cabinet to the wall.
   a. Exposed back on fixed or movable cabinets: 3/4 inch particleboard with the exterior surface finished in VGS laminate as selected.
   b. Flexible rail mounted cabinet backs: 3/4 inch thick particleboard structurally doweled into cabinet sides and top panels.
5. Fixed base and tall units have an individual factory-applied base, constructed of 3/4 inch exterior grade plywood. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawing.
6. Base units, except sink base units: Full sub-top. Sink base units are provided with open top, a welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, a split back removable access panel.
7. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
8. Exposed and semi exposed edges.
   a. Edging: 1mm PVC
9. Adjustable shelf core: 1 inch thick particleboard up to 36 inches wide, 1-inch thick particleboard with corrugated metal ribbed stiffener for shelves over 36 inches wide.
   a. Front edge: 1mm PVC.
10. Interior finish, units with open Interiors:
    a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with VGS High Pressure decorative laminate. Match exterior finish.
11. Interior finish, units with closed Interiors:
    a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back. Color to be selected by Architect.
12. Exposed ends:
    a. Faced with VGS high-pressure decorative laminate.
13. Wall unit bottom
    a. Faced with thermally fused melamine laminate.
14. Wall and tall unit tops:
    a. Top surface is faced with thermally fused melamine laminate.
15. Balanced construction of all laminated panels is mandatory.
16. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.
17. Provide specified grommets in bracket supported countertops. 1 per 5'-0" of countertop. Locations to be determined by Architect.

C. Drawers:
   1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC. Full height sides.
   2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
   3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

D. Door/Drawer Fronts:
   1. Core: 3/4 inch thick particleboard.
   2. Provide double doors in opening in excess of 24 inches wide.
   3. Faces:
      a. Exterior: VGS High-pressure decorative laminate.
      b. Interior: High-pressure cabinet liner CLS.

4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

E. Miscellaneous Shelving: Location: Classroom storage closets.
1. Core material: 3/4 inch or 1 inch particleboard, as required.
2. Exterior & Interior: VGS High-pressure decorative laminate.
3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

PART 3 - EXECUTION

3.01 INSPECTION

A. The casework contractor shall examine the job site and the conditions under which the work under this Section is to be performed, and notify the building Owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 EXAMINATION

A. Verify existing conditions under provisions of Section 01 7000.

B. Verify that openings are ready to receive work.

C. Verify adequacy of support framing anchors.

D. Verify that required utilities are available. In proper locations and ready for use.

E. Beginning of installation means installer accepts existing surface conditions.

3.03 INSTALLATION

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Use anchoring devices to suit condition and substrate materials encountered.

C. Set casework items plumb and square.

D. Install casework attachment rails on wall along entire length of wall to facilitate installation of wall cabinets.

E. Hang wall mounted casework on attachment rails. Level and adjust wall casework using adjustment capabilities of wall unit mounting brackets.

F. Assemble and install worksurface tops on site with use of concealed screws on bases such as base cabinets, pedestals or columns

G. Scribe to abutting surfaces and align adjoining components. Apply matching filler pieces where caseworks abuts dissimilar construction.

H. Repair small scratches and surface blemishes on units using manufacturer's supplied touch up materials. Replace damaged cabinets or materials if directed by Architect.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 7000.

B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.05 CLEANING

A. Clean work under provisions of Section 01 7000.

B. Clean casework, counters, shelves, glass, legs, hardware, fittings, and fixtures.

C. Remove dirt with damp cloth and soap and water. Remove stubborn dirt with non-flammable chlorinated solvents or solvents such as: lacquer thinner, M.E.K., or contact adhesive solvent if area is ventilated sufficiently to prevent build-up of fumes and noticeable odors. Do not use harsh abrasive cleaners.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 5000.

B. Do not permit finished casework to be exposed to continued construction activity.

C. Protect finished casework from damage by water, heat and other causes until final acceptance.

D. Replace casework exhibiting warpage, surface discoloration, and damage at no additional cost to owner.

END OF SECTION

SECTION 126600

TELESCOPING STANDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated telescoping stands.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For telescoping stands in both stacked and extended positions.

1. Include plans, elevations, sections, and attachment details.

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Telescoping stands shall withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.

B. Accessibility Standard: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design.

2.2 TELESCOPING STANDS

A. System Description: Operable system of multiple-tiered seating on interconnected folding platforms that close for storage, without being dismantled, into a nested stack. Telescoping-stand units permit opening and closing of adjacent, individual and multiple rows, and close with vertical faces of platforms in the same vertical plane.
1. Telescoping-Stands Standard: ICC 300.

B. Wall-Attached Telescoping Stands: Forward-folding system, in which the bleachers open in the forward direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to wall construction.

1. Acceptable Manufacturer’s
   a. Hussey Seating Company
   b. Interkal LLC
   c. Irwin Telescopic Seating Company; Irwin Seating Company
2. Operation: Manually operated.

2.3 COMPONENTS

A. Benches: Seats and skirts.

1. Material: Molded plastic with contour surfaces.

   a. Color: As selected by Architect from manufacturer's standard.

2. Bench Height: Not less than 16 inches or more than 18 inches.
3. Bench Depth: 12 inches.

B. Wheelchair-Accessible Seating: Locate retractable truncated benches to provide wheelchair-accessible seating at locations indicated on Drawings.

1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by ICC 300.
2. Equip cutouts with full-width front closure panels that match decking construction and finish and that extend from underside of tiers adjacent to cutouts to 1-1/2 inches from finished floor.

C. Deck: Plywood, 5/8 inch thick.

1. Finish: Transparent.

    a. Color: Manufacturer's standard.

D. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.

E. Safety Rails: Steel, finished with manufacturer's standard powder coat system.

1. Removable mid-aisle handrails located at centerline of each aisle with seating on both sides.
2. End rails (guards) that are telescoping and self-storing.
3. Back rails (guards) along rear of units where required by ICC 300.
4. **Removable** rails around accessible seating cutouts and truncations.
5. Removable, programming-support front rails to allow seating in upper rows while lower rows remain in the stored position.
6. Color: Black.

F. Understructure: Structural steel.

1. Finish: Manufacturer's standard rust-inhibiting finish.
2. Color: Manufacturer's standard.

G. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.

1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 4 inches in diameter and 1-1/2 inch wide.

2.4 ACCESSORIES

A. Steps:

1. Slip-resistant, abrasive tread surfaces at aisles.
2. Intermediate aisle steps, fully enclosed, at each aisle.
3. Transitional top step, fully enclosed, at each aisle where last row of telescoping stands is adjacent to a cross aisle.
4. Removable front steps, fully enclosed, at each aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.

B. Closure Panels and Void Fillers:

1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
2. End panels covering exposed ends of stands in the stored position.
3. Back panels covering rear of freestanding units. Panels extend full height and width of unit.
4. Panels at cutouts and truncations for accessible seating.

5. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
6. Gap fillers for closing openings between stand units or between stand units and adjoining construction.

2.5 MATERIALS

A. Lumber: Kiln dried, surfaced four sides; southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B & B finish (B and better) grade-of-finish requirements.

B. Plywood: PS 1 as standard with manufacturer.

2.6 FABRICATION

A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.

B. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.

C. Form exposed work with flat, flush surfaces, level and true in line.

D. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.

1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install telescoping stands according to ICC 300 and manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

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

B. Perform the following tests and inspections:

1. ICC 300 Inspection: Inspect installed telescoping stands to verify that construction, installation, and operation are according to ICC 300 requirements.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Telescoping stands will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 ADJUSTING

A. Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands.

END OF SECTION 126600

SECTION 133419

METAL BUILDING SYSTEMS

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 a factory finished, single-story, multi-span, rigid-frame-type metal building system with **Straight Columns**, clear span, insulated, pre-engineered metal building system frame, of the nominal length, width, eave height, and roof pitch, as indicated on the Drawings.

1. Exterior walls consist of the following as indicated:
    a. Manufacturer's metal wall panel system with blanket insulation and interior liner panels.
    b. Insulated masonry cavity walls as specified in other sections.
        i. Roof System consists of the manufacturer's standard structural standing-seam, machine-seamed, insulated roof, and trim, with gutters and downspouts, soffits, special finished ceiling and fall-protection/insulation support system below and concealing roof purlins and framing ("Simple Saver System"), and all related work.
2. Manufacturer's standing-seam roofing system specified in this section, including soffit panels, shall also be required to be installed to soffit face and Entrance Canopies.
3. Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.

B. Related work specified elsewhere includes:

1. Division 3 Section – "Cast-In-Place Concrete."
2. Division 4 Section – "Unit Masonry Assemblies."
3. Division 5 Section – "Metal Fabrications."
4. Division 6 Section – "Rough Carpentry."
5. Division 7 Section – "Joint Sealants."
6. Division 8 Section – "Hollow Metal Doors and Frames."
7. Division 8 Section – "Aluminum-Framed Entrances and Storefronts."
8. Division 9 Section – "Painting."

1.3 SYSTEM PERFORMANCE REQUIREMENTS:

A. Metal Building System Performance: Engineer, design, fabricate and erect the pre-engineered metal building system to withstand loads from winds, gravity, structural movement including

movement thermally induced, and to resist in-service use conditions that the building will experience, including exposure to the weather, without failure.

1. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual."
2. Provide grounding system for lightening protection, in compliance with building manufacturer's recommendations.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings. Basic design loads include live load, wind load seismic load and snow load, in addition to dead load.
2. Collateral Loads: Include additional dead loads over and above the weight of the metal building system, such as roof-mounted and suspended mechanical systems, light fixtures, conduits, ductwork, piping, equipment and other items required to be supported by the building structure.
3. Deflection Limits:
   a. Design metal building system assemblies to withstand design loads with deflections no greater than the following:
      1) Purlins and Rafters: Vertical deflection of 1/240 of the span
      2) Girts: Horizontal deflection of 1/240 of the span.
      3) Metal Roof Panels: Vertical deflection of 1/240 of the span.
      4) Metal Wall Panels: Vertical deflection of 1/240 of the span.
      5) Metal Soffit Panels: Horizontal deflection of 1/240 of the span.
   b. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
4. Drift Limits: Engineer building structure to withstand design loads with lateral drift limits no greater than 1/400 of the building height. (This is required due to masonry cladding).
5. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

1. Temperature Change (Range): 120 deg F., ambient; 180 deg F., material surfaces.
2. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

E. Air Infiltration:

1. Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 6.24 lbf/sq. ft.

2. Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at test-pressure difference of 6.24 lbf/sq. ft.
3. Metal Soffit Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of soffit area when tested according to ASTM E 283 at static-air-pressure difference of 1.57 lbf/sq. ft.

F. Water Penetration:

1. Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at a minimum differential pressure of 20-percent of inward-acting wind-load design pressure, but not less than 6.24 lbf/sq. ft.
2. Metal Wall Panels: No water penetration when tested according to ASTM E 331 at the following test-pressure difference 6.24 lbf/sq. ft
3. Metal Soffit Panels: No water penetration when tested according to ASTM E 331 at a minimum differential pressure of 20-percent of inward-acting wind-load design pressure, but not less than 6.24 lbf/sq. ft.

G. Wind-Uplift Resistance Rating: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

H. Structural Framing, and Roofing and Siding / Wall Construction: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual," in accordance with notes and requirements on Structural Drawings, and the following. Where a conflict in requirements may occur, the more stringent requirements shall apply.

1. AISC "Code of Standard Practice for Steel Buildings and Bridges":
   a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
2. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses, including the "Commentary" and Supplements thereto, as issued.
3. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
4. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures, and AWS D1.1 "Structural Welding Code."
5. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

1.4 SUBMITTALS:

A. Product Data: Submit metal building system manufacturer's product information for building components and accessories.

B. Shop Drawings: Submit drawings prepared by or under the supervision of a registered Professional Engineer experienced in the design of pre-engineered metal buildings and currently registered in the State of Georgia, for metal building structural framing system, any roofing and siding panels, and other metal building system components and accessories that are not fully detailed or dimensioned in manufacturer's product data. The responsible design engineer shall place their signed and dated seal on all Shop Drawings.

1. Structural Framing: Furnish complete erection drawings prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located and where the system components are manufactured. Include details showing fabrication and assembly of the metal building system. Show anchor bolts settings and sidewall, endwall, and roof framing. Include transverse cross-sections. Design analysis shall be included, to show all design loads, load combinations, foundation reactions and lateral deflections.
2. Building Accessory Components: Provide details of metal building accessory components to clearly indicate methods of installation.

C. Installer Certificates: Submit written certification signed by metal building manufacturer certifying that the installer complies with requirements included under the "Quality Assurance" Article.

D. Engineer's Design Certification: Submit Professional engineer's certificate prepared and signed by the responsible design Engineer, legally authorized to practice in the jurisdiction where Project is located and where the system components are manufactured, verifying that the structural framing and covering panels meet indicated loading requirements and codes of authorities having jurisdiction.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced Installer to erect the pre-engineered metal building who has specialized in the erection and installation of types of metal buildings systems similar to that required for this project and who is certified in writing by the metal building system manufacturer as qualified for erection of the manufacturer's products.

B. Manufacturer's Qualifications: Provide pre-engineered metal buildings manufactured by a firm with no less than 5-years experience in manufacturing metal buildings systems that are similar to those indicated for this project and have a record of successful in-service performance.

C. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures". Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12-months. If recertification of welders is required, retesting will be Contractor's responsibility.

D. Refer to Division 1 Section - "Special Conditions" for additional information and minimum experience requirements.

E. Single-Source Responsibility: Obtain the metal building system components, including structural framing, any wall and roof covering, and accessory components, from one source from a single manufacturer.

F. Basis of Design Criteria: The drawings indicate size, profiles, and dimensional requirements of the pre-engineered metal buildings and are based on the specific type and model indicated. Metal building systems having equal characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver prefabricated components, any sheets, any panels, and other manufactured items so they will not be damaged or deformed.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay that work.

C. Handling: Exercise care in unloading, storing, and erecting metal building system, and any wall and roof covering panels, to prevent bending, warping, twisting, and surface damage.

D. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store any metal wall and roof panels so that water accumulations will drain freely. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

E. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

F. Refer to Division 1 Sections “Summary of Work” and “Special Conditions” for additional information and requirements regarding stored materials.

1.7 WARRANTY:

A. Metal Building System and Wind Warranty: The manufacturer/installer shall jointly, in writing, warrant that the Pre-Engineered Metal Building System shall remain intact (without perceptible deformation or failure of the metal wall and roof panels or structure within the warranty period) and completely leak free for a period of **20-years** from the date of project Substantial Completion

1. Note: This warranty need not cover damage from winds exceeding the velocities and/or loading required by the International Building Code as generated by a design velocity based on the 100-year probability wind speed, unless otherwise indicated and/or normally provided for the products specified.
2. Warranty Periods (from date of project “Substantial Completion”):
   a. Wind and Weathertightness: **20-years**.
   b. Metal Panel Finishes: **20-years**.
   c. Materials and Workmanship: **3-years**.
   d. Incidental Warranties by Manufacturer’s of Components: Manufacturer’s standard warranties, passed on to the Owner.

B. Repairs that become necessary, such as for leaks, wind damage or temperature stress while building, roofing and siding systems are under warranty and/or guarantee, shall be performed by the installer within 7-days of notification. Should for any reason, the installer not be able to perform the repairs, it shall be incumbent upon the manufacturer to do so. If repairs are not begun on time, Owner shall have work done by others and costs will be charged to the Contractor, with no detrimental effect on the remaining warranty and no termination of warranty.

C. The above warranty and guarantee shall be in addition to, shall be in effect simultaneously with, and shall not alter or limit other project or product warranties or guarantees, nor shall they serve as limitations to other remedies available to the Owner.

D. Standard manufacturer's roofing warrantees and guarantees which contain language regarding the governing of the warrantees and guarantees by any state other than the State of Georgia, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Georgia shall govern all such warrantees and guarantees.

1.8 EXTRA MATERIALS:

A. Maintenance Stock: Furnish at least five-percent (5%) excess over required amount of nuts, bolts, screws, washers, and other required fasteners for metal building. Pack in cartons labeled to identify the contents and store on the site where directed.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturer: Subject to compliance with specified requirements, provide metal building systems by one of the following:

1. A&S Building Systems
2. ACI Building Systems, Inc.
3. **American Buildings Co.** ***(Basis for Design)***
4. Architectural Integrated Metals, Inc.
5. Armco Steelox Building Systems.
6. Atlantic Building Systems.
7. Bigbee Steel Buildings, Inc.
8. Butler Manufacturing Co.
9. Ceco Buildings Division.
10. Gulf States Manufacturers, Inc.
11. Metal Building Components, Inc.
12. O.S.I., Inc.
13. Star Buildings Division, H. H. Robertson Co.
14. Varco-Pruden Buildings.
15. Mesco Building Solutions
16. Dean Steel Buildings, Inc. [Thomasville, GA (229) 225-1112].
17. Vulcan Steel Structures, Inc. [Adel, GA (229) 896-7903].

B. Special Insulated Finished Ceiling and Insulation System Product/Manufacturer: Provide pre-approved equivalent to "Simple Saver System" with fall protection and integral vapor barrier, as manufactured by Thermal Design, Inc.; Madison, NE; Phone: 1-800-255-0776 or (402) 454-6591.

C. Standing Seam Metal Roof Panel System: The roof panel system is PanelCraft 16 Standard Roof System by AllSouth Pre-Engineered Components, LLC. As a Basis of Design, provide the PC-216 roof system with a 2 inch high seam.

2.2 MATERIALS:

A. Hot-Rolled Structural Steel Shapes: Comply with ASTM A 572 or A 529.

B. Steel Tubing or Pipe: Comply with ASTM A 500, Grade B, ASTM A 501, or ASTM A 53.

C. Steel Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with ASTM A 529, ASTM A 570, or ASTM A 572.

D. Steel Members Fabricated by Cold Forming: Comply with ASTM A 607, Grade 50.

E. Cold-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 366 or ASTM A 568.

F. Hot-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 568 or ASTM A 569.

G. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 446 with G90 coating complying with ASTM A 525. Grade to suit manufacturer's standards.

H. Aluminum-Zinc Alloy Coated Steel Sheets ("Galvalume"): Comply with ASTM A 428, latest edition.

I. Thermal Insulation: Glass fiber blanket insulation, complying with ASTM C 991, of 0.5 lb per cu. ft. density, thickness as indicated, with UL flame spread classification of 25 or less, and 2 inch wide continuous vapor-tight edge tabs where integral vapor barrier occurs.

1. General - Special Insulated Finished Ceiling and Fall Protection/Insulation Support System below and concealing roof purlins and framing: Provide equivalent to "Simple Saver System", , in white color, to blend with insulation.
2. Vapor Barrier: Manufacturer's standard reinforced vinyl film; White color.
   a. Modify as required for flame spread requirements.
   b. Perm Rating: No more than 0.1, as per ASTM E-96, Procedure A, latest edition.
   c. All joints lapped and sealed.
3. Retainer Strips: Provide 26-gage (0.0179-inch) formed galvanized steel retainer clips colored to match the insulation facing, for proper installation and preventing damage or falling out of insulation.
4. Insulation Thickness: Continuous and full depth of 10-inch roof purlins (R-30) and full depth of any other purlins is required, installed on "Simple Saver System"; Thermal spacer blocks are also required at roof purlins - in accordance with manufacturer's current written instructions and recommendations.

5. Refer to Drawings for any additional insulation, and additional information; and Division 7 Section "Building Insulation" for additional information and requirements for building envelope insulation, sound batts, etc.

J. Bolts for Structural Framing: Comply with ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

K. Anchor Bolts: ASTM A 307, non-headed type unless otherwise indicated.

L. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

1. Products offered by manufacturers to comply with requirements for non-metallic, non-shrink grout include the following:
   a. Euco N.S.; Euclid Chemical Company
   b. Crystex; L&M Construction Chemicals
   c. Masterflow 713; Master Builders
   d. Five Star Grout; U.S. Grout Corp.
   e. Upcon; Upco Chemical Division, USM Crop.
   f. Propak; Protex Industries, Inc.

M. Paint and Coating Materials: Comply with performance requirements of the federal specifications indicated. Unless specifically indicated otherwise, compliance with compositional requirements of federal specifications indicated is not required.

1. Shop Primer for Ferrous Metal: Fast-curing, lead-free, abrasion- resistant, rust-inhibitive primer selected by the manufacturer for compatibility with substrates with types of alkyd finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with FS TT-P-86, Types I, II, or III.
2. Shop Primer for Galvanized Metal Surfaces: Zinc dust-zinc oxide primer selected by the manufacturer for compatibility with substrate. Comply with FS TT-P-641.

2.3 STRUCTURAL FRAMING:

A. Rigid Frames: Fabricate from hot-rolled structural steel shapes. Provide factory-welded, shop-painted, built-up "I-beam"-shape or open-web-type frames consisting of parallel flange beams and straight columns. Furnish frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.

1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standards, and proposed in writing by manufacturer and accepted in writing by Architect prior to Bid Date.
2. Provide rigid frames at end walls where indicated.

B. Primary Endwall Framing: Provide the following primary endwall framing members fabricated for field-bolted assembly:

1. Endwall Columns: Manufacturer's standard shop-painted, built-up factory-welded "I"-shape or cold-formed "C"-sections, fabricated from 14-gage (0.0747-inch) steel.

2. Endwall Beams: Manufacturer's standard shop-painted "C"-shape roll-formed sections fabricated from 16-gage (0.0598-inch) steel.

C. Secondary Framing: Provide the following secondary framing members:

1. Roof Purlins, Sidewall and Endwall Girts: "C"-or "Z"-shaped sections fabricated from 16-gage (0.0598-inch) shop-painted roll-formed steel. Purlin spacers shall be fabricated from 14-gage (0.0747-inch) cold-formed galvanized steel sections.
2. Eave Struts: Unequal flange "C"-shaped sections formed to provide adequate backup for both wall and roof panels. Fabricate from 16-gage (0.0598-inch) shop-painted roll-formed steel.
3. Flange and Sag Bracing: 1-5/8-inches by 1-5/8-inch angles fabricated from 16-gage (0.0598-inch) shop-painted roll-formed steel, unless indicated otherwise on Structural Drawings.
4. Base or Sill Channels: Fabricate from 14-gage (0.0747-inch) cold-formed galvanized steel sections.
5. Secondary endwall structural members, except columns and beams, shall be the manufacturer's standard sections fabricated from 14-gage (0.0747-inch) cold-formed galvanized steel.
    a. Provide similar members at jambs and headers of Doors, Louvers, storefronts and Windows.

D. Wind Bracing: Provide adjustable wind bracing using 2-inch with ASTM A 36 or ASTM A 572, Grade D. Locate interior end bay bracing only where indicated, or required by project conditions.

E. Bolts: Provide shop-painted bolts except when structural framing components are in direct contact with roofing and siding panels. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels.

2.4 SHOP PAINTING:

A. General: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power-tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning, unless specific procedures are indicated otherwise. Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on portions and initial 2-inch of embedded areas only.

1. Do not paint surface which are to be welded or high-strength bolted with friction-type connections.
2. Prime structural steel primary and secondary framing members with the manufacturer's standard rust-inhibitive primer.
3. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust-zinc oxide primer.
4. Apply 2-coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from the first coat.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 “Solvent Cleaning,” followed by SP-3 “Power Tool Cleaning.”

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer’s instructions. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

2.5 PREFINISHED ROOFING AND SOFFIT PANELS:

A. Face Sheets: Fabricate wall and roof panel face sheets to the profile or configuration indicated from minimum 24-gage (0.0276-inch), 50,000 p.s.i. yield steel sheet. Finish shall be manufacturer’s standard two-coat (i.e.: primer and color coat) “Fluropon Classic II” 70% resin coating, with a minimum dry film thickness (DFT) of 1.0-mils. Base metal shall be one of the following:

1. ASTM A 792 aluminum-zinc allow coated steel sheet (“Galvalume”), or
2. ASTM A 653, G-90 (galvanized) zinc-coated steel sheet.

B. Standing Seam Roof Panels: Manufacturer’s standard factory-formed, flat profile, roof panel system and accessories designed for mechanical attachment of panels to roof purlins and framing, and machine seaming.

1. Roof Panels: Allsouth Pre-Engineered Components, PanelCraft 216, or approved equivalent by one of the above named manufacturers, with concealed anchorage and sealant systems; machine seamed.
   a. Seam Construction: Mechanically seamed, double folded according to manufacturer's standard.
   b. Panel Coverage: 16 inches.
   c. Panel Seam Height: 2 inches.
   d. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from stainless-steel.
2. Finish: Manufacturer’s standard 20-year warranted Two-coat "Fluropon 70% PVDF Coatings” having 70-percent polyvinylidene fluoride resin by weight; with a minimum dry film thickness (DFT) of 1.0-mils
3. Colors: As selected by Owner and Architect after bidding, from manufacturer’s full line of standard non-metallic color selections, to include a minimum of 12 colors to select from.

C. Soffit Panels: Fabricate soffit panel system face sheets and sheet metal accessories to the profile or configuration indicated, designed for mechanical attachment of panels to wall girts and base and eave channels using concealed fasteners and sealants.

1. Soffit Panels: Manufacturer's concealed fastener, flat profile, unperforated, panel system and trim with lapping interlocking edges. Provide from edge to edge of soffits, and at recessed entries and similar conditions.
   a. Panel Surface: Smooth, flat surface.
   b. Panel Coverage: 12-inches, net width.
   c. Panel Height: 1-inch.
2. Finish: Manufacturer’s standard 20-year warranted Two-coat "Fluropon 70% PVDF Coatings” having 70-percent polyvinylidene fluoride resin by weight; with a minimum dry film thickness (DFT) of 1.0-mils

3. Colors: As selected by Owner and Architect after bidding, from manufacturer's full line of standard non-metallic color selections, to include a minimum of 12 colors to select from.

D. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
2. Use only aluminum or stainless steel fasteners for exterior application and galvanized or cadmium-plated fasteners for interior applications.
3. Locate and space fastenings in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
4. Provide fasteners with heads matching color of roofing or siding sheets by means of factory-applied coating. Caps or covers will not be acceptable.

E. Accessories: Provide the following sheet metal accessories factory-formed of the same material (except 50,000 p.s.i. yield strength) in the same finish as roof and wall panels:

1. Flashings.
2. Closures.
3. Fillers.
4. Metal expansion joints.
5. Ridge caps.
6. Fascias and trim.
7. Gutters and downspouts.

F. Flexible Closure Strips: Closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips. Cut or premolded to match configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.

G. Sealing Tape: Pressure-sensitive 100-percent solids gray polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 2-inch wide and 1/8-inch thick.

H. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.

1. Refer to Division 7 Section - "Joint Sealants," for additional information.

2.6 PREFINISHED WALL PANELS:

A. Exterior Wall Panels: Provide manufacturer's standard panels complying with the following:

1. Panel Profile and Design: Ribbed wall panels fabricate from metallic-coated steel sheets prepainted with coil coating, factory formed with raised trapezoidal major ribs at 12-inches on center, and intermediate stiffening ribs symmetrically spaced between major ribs for full length of panel. Design panels for mechanical attachment to structure using concealed fasteners.
2. Panel Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel as specified. Prepainted by the coil-coating process to comply with ASTM A 755.

a. Yield Strength: Minimum 50 ksi.

b. Metal Thickness: 24-gauge (0.0276-inch), minimum.

3. Panel Coverage: 36-inches.

4. Panel Thickness: 1.5-inches.

5. Finishes:

a. Exposed Coil-Coated Finish: Manufacturer's two-coat fluoropolymer finish complying with AAMA 621 containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Coating Thickness: 1.0 mil, minimum total dry film thickness; 0.2 mil for primer and 0.8 mil for topcoat.

2) Colors: As selected by Architect from manufacturer’s full line of standard non-metallic color selections, to include a minimum of 12 colors to select from.

b. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5-mil.

B. Concealed-Fastener, Flush-Profile, Metal Wall Panels: Formed with vertical panel edges and flush surface; with flush joint between panels; with 1-inch- (25-mm-) wide flange for attaching interior finish; designed to be installed 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.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

2. Exterior Finish: [Fluoropolymer] [Siliconized polyester].

3. Color: As selected by Architect from manufacturer's full range.

4. Panel Coverage: 16 inches (406 mm).

5. Panel Height: 3 inches (76 mm).

C. Interior Metal Liner Panels: Manufacturer's flush-profile, perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with flush joint between panels; designed for interior side of metal wall panel assemblies and installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.

1. Panel Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel as specified. Prepainted by the coil-coating process to comply with ASTM A 755; 26-gauge (0.0217-inch), minimum thickness.

2. Panel Coverage: 12-inches.

3. Panel Height: 1.5-inches.

4. Panel Perforations: Provide panel perforations equal to at least 40-percent open area.

5. Finishes:

a. Exposed Coil-Coated Finish: Manufacturer's siliconized polyester finish consisting of epoxy primer and silicone-modified, polyester-enamel topcoat.

1) Coating Thickness: 1.0 mil, minimum total dry film thickness; 0.2 mil for primer and 0.8 mil for topcoat.

2) Colors: As selected by Architect from manufacturer's full range selections.

D. Wall Panel Accessories: Provide components required for a complete wall panel assembly, including trim, copings, mullions, sills, corner units, clips, seam covers, battens, flashings, sealants, gaskets, fillers, closure strips, and similar items.

1. Materials and Finish: Match materials and finishes of panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

2.7 THERMAL INSULATION

A. Acceptable Insulation System: - Special Insulated Finished Ceiling and Fall Protection/Insulation Support System concealing roof purlins and wall framing: Provide equivalent to Thermal Design, Inc, "Simple Saver System", in white color, to blend with insulation.

B. Thermal Performance:

1. Roof: Provide insulation assemblies with having total R-30 (30 deg F × h × sq. ft./Btu at 75 deg F), minimum, thermal resistance when tested according to ASTM C 1363 or ASTM C 518. Insulation shall be installed in two layer application; continuous and full depth of purlins and full depth of any other purlins is required, installed on "Simple Saver System"; Thermal spacer blocks are also required at roof purlins - in accordance with manufacturer's current written instructions and recommendations.
2. Walls Provide with insulation having R-19 (19 deg F × h × sq. ft./Btu at 75 deg F), minimum, thermal resistance when tested according to ASTM C 1363 or ASTM C 518.

C. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch wide, continuous, vapor-tight edge tabs; with a flame-spread index as specified.

1. Vapor-Retarder Facing: Vinyl-faced, scrim-reinforced foil complying with ASTM C 1136 with permeance not greater than 0.1 perm when tested in accord with ASTM E 96, Desiccant Method.
2. Surface Burning Characteristics: Flame-spread index of 25 or less when tested in accord with ASTM E 84.
3. Sizes:
   a. Roof: Provide widths to fit between purlins and in maximum continuous lengths available to accommodate installation with minimum laps.
   b. Walls: Manufacturer's standard widths in maximum continuous lengths available to accommodate installation with minimum laps.
4. Location: Provide for top layer roof insulation assembly and for wall insulation.

D. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch wide, continuous, vapor-tight edge tabs; with a flame-spread index as specified.

1. Surface Burning Characteristics: Flame-spread index of 25 or less when tested in accord with ASTM E 84.
2. Size: Manufacturer's standard width in maximum continuous lengths available to accommodate installation with minimum laps.
3. Location: Provide for bottom layer roof insulation assembly.

E. Perforated Fabric Liner: Perforated, fabric liner complying with ASTM C 1136, Types I through Type VI; composed of woven reinforced woven, high-density polyethylene yarns coated on both sides with continuous polyethylene coatings. Provide fabric comparable to Thermal Design ,Inc.; "Syseal" and complying the following specified characteristics.

1. Perforations: Perforated with 3/16-inch diameter holes spaced at not more than 4-inches apart in each direction.
2. Flame Spread and Smoke Density Properties: Flame-spread index of 25 or less and smoke development not more than 50 when tested in accord with ASTM E 84.
3. Size and Seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
4. Color: As selected by Architect from manufacturer's standard color selection.
5. Locations: Provide for installation to interior exposed face of roof and wall assemblies.

F. Retainer Strips: Provide 0.020-inch (26-gauge) nominal-thickness formed galvanized steel retainer clips colored to match the insulation facing, for proper installation and preventing damage or falling out of insulation.

G. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

H. Thermal Breaks: Type as recommended by insulation system manufacturer for installation of wall insulation.

I. Wall Insulation Hangers: Preformed rigid barbed galvanized steel hangers strips of type as recommended by insulation system manufacturer.

J. Refer to Drawings for any additional insulation, and additional information; and Division 7 Section "Building Insulation" for additional information and requirements for building envelope insulation, sound batts, etc.

2.8 SHEET METAL ACCESSORIES:

A. General: Provide coated steel sheet metal accessories with coated steel roofing and siding panels.

B. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (26-gauge) nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch (22 gauge) nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

C. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (26-gauge) nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 10-foot (120-inches) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs.
2. Furnish gutter supports spaced 36-inches (3-ft.) on center, constructed of same material and finish as gutters.
3. Provide bronze, copper, or aluminum wire ball strainers at outlets.

D. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (26-gauge) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot (120-inches) long sections, complete with formed elbows and offsets.

1. Provide off-set wall anchor straps at top, bottom, and equally spaced no more than 5-ft. (5'-0") on center. Straps shall be fabricated from same material and finish as downspouts.
2. Provide precast concrete splashblock with 3 raised edges, approximately 12” x 24”, for each downspout that would otherwise spill out onto grade or paving, and metal pan for any downspout that would otherwise spill out onto roofing below.

2.9 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

1. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws**,** with EPDM sealing washers bearing on weather side of metal panels.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

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

D. Metal Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100-percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
2. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.10 FABRICATION:

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly.

1. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged, and reassembled with a minimum amount of labor.
2. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements.

1. Comply with indicated profiles and with dimensional and structural requirements.
2. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 EXECUTION

3.1 METAL BUILDING SYSTEM ERECTION:

A. Surveys: Employ a registered professional engineer or and surveyor, experienced in survey work, to establish permanent bench marks as shown and as necessary for accurate erection of pre-engineered steel structures. Check elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate location.
2. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete.

E. Setting Bases and Bearing Plates: Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on steel wedges or shims or other adjusting devices.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove steel wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and bases of plates to ensure that no voids remain.
    a. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.
    b. Moist cure grout for not less than 7-days after placement.

F. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within specified AISC tolerances.
2. See base plates with double-nutted anchor bolts, and as otherwise required.
3. Splice members only where indicated and accepted on shop drawings.

4. Purlins and Girts: Provide rake or gable purlins with tight-fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.
5. Bracing: Provide diagonal rod or angle bracing in roof and sidewalls as indicated.
   a. Movement-resisting frames may be used in lieu of sidewall rod bracing, to suit manufacturer's standards.
   b. Where diaphragm strength of roof or wall covering is adequate to resist wind forces, rod or angle bracing will not be required, except when indicated on Structural Drawings.
6. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.
7. Roofing and Siding:
   a. General: Arrange and nest sidelap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage.
      1) Field cutting of exterior panels by torch is not permitted.
      2) Provide weatherseal under ridge cap. Flash and seal roof panels at eave, rake, ventilators, and similar locations with rubber, or neoprene, or other acceptable closures to exclude weather and in compliance with warranty requirements.
   b. Roof Panels: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheets and skylights, protruding equipment, roof ventilators, vents, and accessories. Seal joints in roof panels in accordance with roof manufacturer's current written recommendations and requirements. Machine-seam joints in roof panels in accordance with roof manufacturer's written recommendations and requirements.
      1) Apply a continuous ribbon of sealant tape to clean, dry surface of the weather side of fastenings on end laps, and on side laps of corrugated nesting-type, ribbed, or fluted panels and elsewhere as needed to make roof sheets weatherproof to driving rains.
      2) Align with corrugations in wall panels.
   c. Wall Panels: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with the sealant manufacturer's current written instructions and recommendations.
      1) Align bottom of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws. Fasten window and door frames with machine screws or bolts. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
      2) Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
      3) Provide weatherproof flashing, and weatherproof counterflashing escutcheons for pipe and conduit penetrating exterior walls.

4) Align with corrugations in roof panels.

d. Interior Liner Panels: Install perforated metal liner panels to interior side of wall girts at locations indicated. Comply with same application methods for attachment as specified for wall panels.

G. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

I. Sheet Metal Accessories: Refer to Division 7 Section "Flashing and Sheet Metal" and Division 10 Section "Louvers and Vents." Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

1. Provide one-precast concrete splashblock at each downspout which drains onto grade, and one-preformed metal pan at each downspout which drains onto roof below.
   a. Size: Approximately 12-inches wide × 28-inches long × 3-inches high, including raised edge at sides and one end.

J. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint.

1. Apply paint to exposed areas with same material as used for shop painting.
2. Apply by brush or spray to provide a minimum dry fill thickness of 2.0-mils.

3.2 THERMAL INSULATION INSTALLATION

A. Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder oriented toward exterior side of building envelope (away from interior of building), unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Roof Insulation: Install in two layers according to insulation system manufacturer's written instructions.

1. Retainer Strips: Cut straps to length and install in the pattern and spacings indicated on shop drawings. Tension straps to required value.
2. Fabric Liner: Install perforated fabric liner in large one-piece custom fabricated pieces to fit roof areas with minimum practicable job site sealing.

a. Position pre-folded fabric on the installed strap platform along one eave purlin.

b. Clamp the two bottom corners at the eave and also centered on the bay.

c. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.

d. Once positioned, install fasteners from the bottom side at each strap and purlin intersection.

e. Trim edges and seal along the rafters.

3. Insulation:

a. Install first layer of unfaced insulation fitted parallel between roof purlins over attached fabric liner and retainer strips. Ensure that cavities are filled complete with insulation without voids or gaps.

b. Install top layer faced insulation placed over and perpendicular to roof purlins with vapor barrier oriented outward towards exterior (away from interior side of roof assembly).

c. Coordinate and sequence installation so that roof panels are installed after placement of insulation it will be covered as soon as possible.

C. Wall Insulation: Install in single layer according to insulation system manufacturer's written instructions

1. Insulation: Install faced insulation with vapor barrier oriented outward towards exterior (away from interior side of wall assembly).

a. Install thermal break as recommended by insulation system manufacturer to exterior surface of girts as wall panels are applied.

b. Position and secure barbed insulation hangers to girts positioned on the inside face of wall panels.

c. Cut insulation to required lengths to fit exact vertical height snug between girts.

d. Fluff the insulation to the full-specified thickness and position in place impaled to barbed hangers. Install insulation continuous between grits ensuring that cavities are filled complete without voids or gaps.

2. Fabric Liner: Install perforated fabric liner over interior side of wall girts and in-place insulation, full height extending from eave line to lap behind interior metal liner panels. Install fabric liner in large one-piece custom fabricated pieces to fit wall areas with minimum practicable job site sealing.

a. Apply the liner fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.

b. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and at 60 inches (5'-0") on center, maximum, fastening to each girt to retain system permanently in place.

3.3 FIELD QUALITY CONTROL:

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. It shall be the

responsibility of the Contractor to notify testing laboratory with sufficient information and in sufficient time for the laboratory to perform inspections and tests.

1. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated or produces so that required inspection and testing can be accomplished.
3. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
4. Contractor shall correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

B. Shop Bolted Connections: Inspect in accordance with AISC specifications.

C. Shop Welding: Inspect during fabrication of structural steel assemblies, as follows:

1. Certify welders and conduct inspections as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Perform visual inspection of all welds.

D. Field Bolted Connections: Inspect in accordance with AISC specifications.

E. Field Welding: Inspect during erection of structural steel as follows:

1. Certify welders and conduct inspections as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
2. Perform visual inspection of all welds.

F. Special Inspections: As required by Building Code, shall be coordinated by the Contractor and conducted by a qualified, independent testing agency, employed and paid by the Owner. Refer to Structural Drawings and Building Code for additional information and requirements.

3.4 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Touchup Painting: A fter erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing**,** bearing plates, and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer.

1. Maintain installed metal panesl in a clean condition during construction.
2. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF METAL BUILDING SYSTEMS

SECTION 142423

HYDRAULIC PASSENGER ELEVATOR

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes: Machine room-less (MRL) above-ground hydraulic passenger elevator as shown and specified. Elevator work includes:

1. Standard pre-engineered hydraulic passenger elevator.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Operation and control systems.
4. Jacks.
5. Accessibility provisions for physically disabled persons.
6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:

1. Division 3 Section - Cast-In-Place Concrete: Installing inserts, sleeves and anchors in concrete.
2. Division 4 Section - Unit Masonry: Installing inserts, sleeves and anchors in masonry.
3. Division 5 - Metals sections:
   a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
   b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
4. Division 9 – Finishes sections: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
5. Division 22 Plumbing sections: Sump pit and oil interceptor.
6. Division 23 Heating, Ventilation and Air Conditioning sections: Heating and ventilating hoistways and control room.
7. Division 26 – Electrical sections:
   a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
   b. Emergency power supply, transfer switch and auxiliary contacts.
   c. Heat and smoke sensing devices.
   d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.

C. Work Not Included in Elevator Work: General contractor shall provide the following according with the requirements of the governing building code and ANSI A17.1 Code.

For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is a part of the building construction.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75-degrees on all recesses, projections or setbacks over 2-inches (4'-inches for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42'-inches minimum, (48'-inches minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. General contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.

20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8-inches thick. This is due to the controller being mounted on the second-floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right-hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures and other required recessed items.

1.2 PERFORMANCE REQUIREMENTS:

A. Regulatory Requirements: Comply with the applicable provisions of the following:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. International Building Code (IBC), 2012 edition with State of Georgia Admendments.
3. NFPA 70 National Electrical Code.
4. NFPA 80 Fire Doors and Windows.
5. Section 407 in ICC A117.1, when required by local authorities.

B. Accessibility Requirements: Comply with applicable provisions of the following regulations and standards.
1. Code of Federal Regulations (CFR), Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
2. ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Design Earthquake Spectral Response Acceleration Short Period (Sds) for Project: As indicated on Drawings.
3. Project Seismic Design Category: C.
4. Elevator Component Importance Factor: 1.0

D. Fire-Rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, UL10(b), and NFPA 80

Standard. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory.

1.3 SUBMITTALS:

A. Product data: Submit standard cab, entrance and signal fixture data to describe product for approval.

B. Shop Drawings:

1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat Paint Selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

D. Plastic Laminate Selection: Submit manufacturer's standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, submit standard metal samples.

F. Operation and Maintenance Data: Include the following in maintenance manuals submitted as part of contract closeout documents.

1. Owner's manuals and wiring diagrams.
2. Parts list, with recommended parts inventory.

1.4 QUALITY ASSURANCE:

A. Manufacturer Qualifications: An approved manufacturer with minimum fifteen (15) years of experience in manufacturing, installing, and servicing elevators of the type required for the project.

1. The manufacturing of machines, controllers, signal fixtures, door operators, cabs, entrances, and all other major parts of elevator operating equipment shall be by the manufacturer.
2. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
3. The manufacturer shall have a documented, on-going quality assurance program.
4. ISO-9001:2000 Manufacturer Certified.
5. ISO-14001:2004 Environmental Management System Certified.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than fifteen (15) years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Inspection and Testing:

1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
2. Arrange for inspections and make required tests.
3. Deliver to the Owner upon completion and acceptance of elevator work.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.6 PROJECT CONDITIONS:

A. Temporary Use: Limit temporary use for construction purpose. Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

1.7 WARRANTY:

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for twelve (12) months after final acceptance.

1.8 MAINTENANCE:

A. Furnish maintenance and call back service for a period of three (3) months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.

1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular

working hours.

2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
3. Manufacturer shall have a service office and full-time service personnel within a 100 mile radius of the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers; subject to compliance with specified requirements, provide hydraulic elevator system by one of the following:
1. Otis Elevator Company.
2. Schindler Elevator Corporation.
3. ThyssenKrupp Elevator Corporation.

2.2 HYDRAULIC PASSENGER ELEVATOR SYSTEM:

A. Basis of Design: ThyssenKrupp; EnduraMRL Above-Ground (2-Stage).
1. Elevator system of similar design and construction by other acceptable manufacturers may be submitted for Architect's acceptance.
2. Acceptance is subject to compliance with specified requirements as evidenced by submittal of manufacturer's product data and shop drawings.

B. Elevator System Description: Pre-engineered machine room-less twinpost above ground hydraulic elevator.
1. Capacity: 3500 lbs.
2. Speed: 150 fpm.
3. Travel: 14'-4".
4. Number of Landings: Two.
5. Number of Openings: Two each in line.
6. Car Inside Dimensions: 6'-8" wide by 5'-5" deep, approximate.
7. Car Platform Dimensions: 7'-0" wide by 6'-3" deep, approximate.
8. Car Height: 9'-0", nominal, to underside of canopy.
9. Car Doors: 3'-6" wide by 8'-0" high; single speed, center opening.
10. Hoistway Doors: 3'-6" wide by 8'-0" high; single speed, center opening.
11. Controller Location: Top landing in front hoistway wall.

C. Power Supply: 480 V, 60 Hz, 3-phase.

2.3 BASIC MATERIALS:

A. Steel:
1. Shapes and Bars: ASTM A 36, carbon structural steel.
2. Sheets: ASTM A 1008/A 1008M, cold-rolled steel sheet; commercial quality, Class 1, matte finish.

3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection based on elevator manufacturer's standard selections.

B. Stainless Steel:

1. Sheets and Plates: ASTM A 240/A 240M, Type 304 alloy.
2. Tubing: ASTM A 554, Grade MT 304.

C. Aluminum:

1. Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.
2. Plates and Sheets: ASTM B 209.

D. Particleboard: Meeting ANSI A208.1, mat-formed, manufactured with water resistant adhesives containing no urea formaldehyde; fire-retardant treated, meeting Class A per ASTM E 84 or UL 723.

E. Plastic Laminate: Decorative high-pressure type, complying with NEMA LD3, Grade HGS General Purpose Type, nominal 0. 0.048-inch thickness. Laminate selection must be based on elevator manufacture's standard selections.

F. Car Floor Finish: To be selected from manufacturers standard finishes.

G. Colors, Patterns, and Finishes: To be determined.

2.4 HOISTWAY EQUIPMENT:

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall be designed and fabricated to support one-piece loads weighing up to 25-percent of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to insure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction.

1. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the assembly.

a. Each jack section will be guided from within the casing or the plunger assembly used to house the section.

b. Each plunger shall have a high-pressure sealing system which will not allow for seal movement or displacement during the course of operation.

c. Each jack assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position.

2. Jacks shall be designed to be mounted on the pit floor or in a recess in the pit floor.

3. Each jack section shall have a bleeder valve to discharge any air trapped in the section.

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit.

I. Pit moisture/water sensor located approximately 1-foot above the pit floor to be provided. Once activated, elevator will perform “flooded pit operation”, which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also, a means for manual operation at the valve in the pit is required.

2.5 POWER UNIT:

A. Power Unit (Oil Pumping and Control Mechanism): Manufacturer's self-contained unit located in the elevator pit consisting of the following items:

1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather

2. Oil hydraulic pump.

3. Electric motor.

4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10-percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30-percent motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.

1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10-percent above that required to barely open the valve.
2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (such as pump motor and starter).
8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.6 HOISTWAY ENTRANCES:

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.

1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish.
3. Typical door & frame finish: Stainless steel panels, No. 4 brushed finish.

B. Integrated Control System: Elevator controller shall be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See Control System article in these specifications for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3-phase circuit breaker. See section Miscellaneous Elevator Components article in these specifications for further details.

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. Door Hanger and Tracks: Provide sheave type two-point suspension hangers and tracks for each hoistway horizontal sliding door.

1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.7 PASSENGER ELEVATOR CAR ENCLOSURE:

A. Car Enclosure:

1. Walls: To be selected from manufacturer’s standard finishes.
2. Canopy: Cold-rolled steel with hinged exit.
3. Ceiling: Manufacturer’s polished stainless steel metal ceiling panels with recessed LED downlight system.
4. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with No. 4 brushed stainless steel.
5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
   a. Door Finish: Stainless steel panels; No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.
6. Handrail: 1.5-inch diameter cylindrical stainless-steel railing on side and rear walls of car. Handrails shall be No. 4 brushed stainless-steel finish.
7. Ventilation: Manufacturer’s standard exhaust fan, mounted on the car top.
8. Floor Finish: To be determined.
9. Pad Hooks: Provide manufacturers standard pad hooks mounted to uppermost position of car walls.
10. Pads: Provide one set of pads in color selected by Architect from manufacturer's standard selection.

B. Car Top Inspection: Provide a car top inspection station with an “Auto-Inspection” switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.8 DOOR OPERATION:

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the

position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer-based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.

1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red-light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.9 CAR OPERATING STATION:

A. Car Operating Station: Main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate.
   1. Wrap return shall have a No. 4 brushed stainless steel finish.
   2. Main car operating panel shall be mounted in the return and comply with ADA requirements.
   3. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code.
   4. Switches for car light and accessories shall be provided.

B. Emergency Communication System: Provide hands-free audio and visual 2-way emergency communication between car and a 24-hour monitoring service. System automatically dials preprogrammed number of monitoring service and identifies elevator location to monitoring service. System shall be contained in flush-mounted cabinet complete with identification, instructions for use, and battery back-up power supply, and complies with ADA regulations.

C. Auxiliary Operating Panel: Not Required

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

2.10 CONTROL SYSTEMS:

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
   1. Access to main control board and CPU
   2. Main controller diagnostics
   3. Main controller fuses
   4. Universal Interface Tool (UIT)
   5. Remote valve adjustment
   6. Electronic motor starter adjustment and diagnostics
   7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
   8. Operation of auxiliary pump/motor (secondary hydraulic power source)
   9. Operation of electrical assisted manual lowering
   10. Provide male plug to supply 110VAC into the controller
   11. Run/Stop button

C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

D. Emergency Power Operation: (Battery Lowering 10-DOC) When the loss of normal power is detected, a battery lowering feature is to be activated. The elevator will lower to a predetermined level and open the doors. After passengers have exited the car, the doors will close and the car will shutdown. When normal power becomes available, the elevator will automatically resume operation. The battery lowering feature shall be included in the elevator contract and does not utilize a building-supplied standby power source.

2.11 HALL STATIONS:

A. Hall Stations: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.

1. Provide one pushbutton riser with faceplates having a No. 4 brushed stainless-steel finish.
2. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: Provide manufacturer's electronic dot matrix position indicator mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing.

1. Faceplates shall match hall stations.
2. Provide at main landing only.

2.12 MISCELLANEOUS ELEVATOR COMPONENTS:

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed.

B. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION:

A. Install elevator systems components and coordinate installation of hoistway wall construction.

1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, where recommended by manufacturer.

3.3 FIELD QUALITY CONTROL:

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING:

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING:

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway.

1. Remove trash and debris.
2. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION:

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION:

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

END OF SECTION 142423

SECTION 210500

COMMON WORK RESULTS FOR FIRE PROTECTION

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. Piping materials and installation instructions common to most piping systems.
2. Sleeves.
3. Escutcheons.
4. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces, mechanical equipment rooms and equipment platform areas.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include roof overhang and loading dock canopy areas.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Valves.
2. Pipe and Pipe Fittings.
3. Sprinkler Heads.

4. Piping layout drawings.
5. Hangers.
6. Hydraulic Calculations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

C. Refer to Architectural reflective ceiling plans for additional notes for the installation and locations of sprinkler heads in ceilings.

D. Coordinate routing of sprinkler mains and branch lines to high bay areas with architectural plans so that all piping is concealed.

1.8 RECORD DRAWINGS

A. As the work progresses, the Contractor shall maintain records and record all changes made daily on a set of record sprinkler installation shop drawings during the progress of the work. The in-progress set of marked-up drawings, clearly showing the nature and extent of all changes, shall be maintained in the construction office at the site and clearly marked “Record Drawings”. The “Record Drawings” shall be up to date and available for use at time of any job site visit by the Engineer or Architect. The completed “Record Drawings” shall be turned over to the Architect upon completion and acceptance of the work. A copy of these record drawings along with a copy of the Fire Marshall approved plans shall be attached to the sprinkler riser. Final payment and “close-out” of the project shall be dependent upon receipt and acknowledgment of the completed “Record Drawings”.

B. Submittal for electronic Record Drawings shall be made on compact disk in PDF format and accompany one (1) full size set of bond plots black on white background. Plots shall be generated from the CD of electronic files. Electronic file names and plot sheet numbering system shall match Contract Document format.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. 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 thickness or specific material is indicated.
a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.3 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
1. Finish: Polished, chrome plated.

B. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

2.4 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000- psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

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. Select system components with pressure rating equal to or greater than existing system operating pressure.

J. Install escutcheons for penetrations of walls, ceilings, and floors in finished areas exposed to view.

K. Install sleeves for pipes passing through concrete and masonry walls.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section - "Joint Sealants" for materials.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression piping.

END OF SECTION 210500

SECTION 211313

WET-PIPE SPRINKLER SYSTEMS

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. Section Includes:
1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Sprinklers.
5. Alarm devices.
6. Pressure gages.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.4 EXISTING SYSTEM DESCRIPTION

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.5 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system modifications by a qualified professional Fire Protection Engineer, using performance requirements and design criteria indicated for bidding purposes only. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VISIT THE SITE AND PERFORM A CERTIFIED FLOW TEST, CONSULT WITH THE LOCAL AUTHORITY HAVING JURISDICTION, OR OTHERWISE OBTAIN POSITIVE CONFIRMATION OF THE AVAILABLE WATER SUPPLY PRIOR TO THE COMMENCEMENT OF HYDRAULIC CALCULATIONS AND DESIGN. CONTRACTOR SHALL SUBMIT WRITTEN DOCUMENTATION OF ANY FLOW TEST DATA OBTAINED THROUGH THIS PROCEDURE. FIRE FLOW TESTS PERFORMED AT THE SITE SHALL BE WITNESSED BY AN INDEPENDENT THIRD PARTY KNOWLEDGEABLE OF THESE MATTERS AND ATTESTING THERETO IN WRITING.

C. Sprinkler system design modifications shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

1. Sprinkler Occupancy Hazard Classifications:
   a. See Appendix A in NFPA 13 for recommended hazard classifications.
   b. Building Service Areas: Ordinary Hazard, Group 1.
   c. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
   d. General Storage Areas: Ordinary Hazard, Group 1.
   e. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   f. Office and Public Areas: Light Hazard
   g. Classrooms: Light Hazard

2. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
   b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

3. Maximum Protection Area per Sprinkler: Per UL listing.

4. Maximum Protection Area per Sprinkler:
   a. Office Spaces: 225 sq. ft.
   b. Mechanical Equipment Rooms: 130 sq. ft.
   c. Electrical Equipment Rooms: 130 sq. ft.
   d. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:
   a. Light-Hazard Occupancies: 100 gpm for 30 minutes
   b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For existing wet-pipe sprinkler system modifications. Include plans, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Coordination Drawings: Sprinkler system modifications, drawn to scale, on which the following items are shown and/or coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.

2. Items penetrating finished ceiling include the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Ductwork
   d. Exit Lights
   e. Audio system ceiling mounted speakers.

E. Qualification Data: The system modifications shall be installed by an experienced firm duly licensed by the State of Georgia Fire Marshall's Office for the installation of fire sprinkler systems and which shall, upon request, submit the names of 3 installations of similar size.

F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction.

G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13.

H. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer's responsibilities include designing, fabricating, and installing a finished sprinkler system and providing professional engineering services needed to assume engineering responsibility.

B. NFPA Standards: Sprinkler system equipment, specialties, accessories, Installation, and testing shall comply with the following:
   1. NFPA 13, "Installation of Sprinkler Systems."

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. No fire sprinkler piping shall be routed within a 42" envelope of any electrical panel or switchboard, contiguous to the structure above.

C. Locations of any new test and drain piping shall be shown on the sprinkler shop drawings and closely coordinated with the Architect. Wherever possible, and subject to the local Authority Having Jurisdiction, route inspectors' test and drain connections, and auxiliary drain systems concealed above ceilings, with proper identification signage for test and drain valves, above ceilings, with discharge piping (normally dry) concealed in exterior wall to terminate outside, above grade, with the required orifice simulating flow from a single sprinkler head.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.02 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell end and plain end.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron gland, rubber gasket, and steel bolts and nuts.
      a. Manufacturers:
         1) U.S. Pipe
         2) Griffin Pipe
         3) McWayne

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell end and plain end.
   1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern.
   2. Gaskets: AWWA C111, rubber.
      a. Manufacturers:
         1) U.S. Pipe
         2) Griffin Pipe
         3) McWayne

2.3 STEEL PIPE AND FITTINGS

A. Domestic Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed threaded ends.
   1. Cast-Iron Threaded Flanges: ASME B16.1.
   2. Malleable-Iron Threaded Fittings: ASME B16.3.
   3. Gray-Iron Threaded Fittings: ASME B16.4.
   4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
   5. Steel Threaded Couplings: ASTM A 865 hot-dip galvanized-steel pipe where indicated.

6. Manufacturers:
   a. Smith-Cooper
   b. Stockham
   c. Grinnell/Anvil International

B. Grooved End - Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and greater than Schedule 10, and with factory- or field-formed grooved ends.
1. Approved Manufacturers:
   a. Bullmoose Tube Company
   b. Wheatland Tube Company
   c. Allied Pipe
   d. Northwest Pipe
   e. Weld-Tube
   f. Youngstown Tube Company

C. Grooved End - Couplings:
1. Approved Manufacturers:
   a. Victaulic
   b. Gruv-Lock
   c. Frink

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.
1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
3. Minimum Pressure Rating for High-Pressure Piping: 250 psig.

B. Ball Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anvil International, Inc.
   b. Victaulic Company.
   c. Milwaukee Valve Company.
2. Standard: UL 1091 except with ball instead of disc.

3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
5. Valves NPS 3: Ductile-iron body with grooved ends.
6. Pressure Rating: 175 psig.
7. Body Material: Cast or ductile iron.
8. Style: Lug or wafer.
9. End Connections: Grooved.

C. Check Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
a. Anvil International, Inc.
b. Milwaukee Valve Company.
c. Mueller Co.; Water Products Division.
d. Potter Roemer.
e. Reliable Automatic Sprinkler Co., Inc.
f. Tyco Fire & Building Products LP.
g. Victaulic Company.
2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

2.06 TRIM AND DRAIN VALVES

A. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Fire Protection Products, Inc.
b. United Brass Works, Inc.
c. Central Sprinkler Corp.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Fire-End & Croker Corporation.
d. Milwaukee Valve Company.
e. Potter Roemer.
f. Tyco Fire & Building Products LP.
g. Victaulic Company.

D. Globe Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Fire Protection Products, Inc.
b. United Brass Works, Inc.
c. Central Sprinkler Corp.

2.07 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electric Alarm Bell: Bell shall have under dome strickers and operating mechanism. Bells shall be no smaller than nominal 6" with an operating voltage of 24VDC or 120VAC. Bells shall be suitable for surface or semi-flush mounting. Bells shall be listed for outdoor use. Wiring to be coordinated with Division 26.
1. Manufacturers:
a. System Sensor
b. Potter Electric Signal Company
c. Viking

C. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
1. Manufacturers:
a. Potter Electric Signal Company.
b. System Sensor.
c. TYCO Fire Protection Products

D. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
1. Manufacturers:
a. Potter Electric Signal Company.
b. System Sensor.
c. Kennedy Valve; division of McWane Industries.

2.08 PRESSURE GAGES

A. Manufacturers:
1. AGF Manufacturing Co.
2. AMETEK, Inc.; U.S. Gauge.
3. Brecco Corporation.
4. Dresser Equipment Group; Instrument Div.

B. Description: UL 393, 3-1/2- to 4-1/2-inch- diameter, dial pressure gage with range of 0 to 250 psig minimum

1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.

C. Air System Piping: Include caption "AIR" or "AIR/WATER" on dial face.

2.9 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc.
3. Tyco Fire & Building Products LP.
4. Victaulic Company.
5. Viking Corporation.

B. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Sprinkler Types
1. Sprinkler heads for installation in areas with acoustical tile ceilings with piping concealed above ceiling shall be standard 1/2" orifice, semi-recessed chrome plated pendent sprinkler heads with chrome escutcheons. Sprinklers shall be quick response type for all light hazard occupancies.
2. Sprinkler heads for installation in gyp board ceilings shall be concealed, pendent type, standard 1/2" orifice with white closure plate to fit flush with face of ceiling.
3. Exposed sprinkler heads on exposed piping shall be standard 1/2" orifice, brass upright, with bronze finish.
4. Sidewall sprinkler heads, where required, shall be horizontal sidewall heads, 1/2" orifice, with chrome plated finish.
5. Sprinkler heads installed in Gymnasium and in areas subject to physical damage shall have listed sprinkler head guards installed to protect sprinkler heads.
6. Dry pipe sprinkler heads shall be installed off of the wet pipe sprinkler system to provide coverage for overhead canopy areas at the loading dock when and where required by the AHJ. No wet pipe sprinkler piping shall be routed thru or installed above non-heated spaces above ceilings or soffits.

D. Sprinkler Head Specialties and Options:
1. Install sprinkler guards on all sprinklers located lower than 7'-0" above the floor.
2. Fire sprinklers installed in locations subject to direct sunlight or elevated temperatures shall have minimum 200-212 degrees Fahrenheit temperature rating.

E. Exposed horizontal sprinkler piping in lowest landing of stairwells shall be installed tight to structure. Piping shall be routed parallel to and above bottom steel framing so that piping is not accessible.

F. Automatic Sprinklers with Heat-Responsive Element:
   1. Nonresidential Applications: UL 199.
   2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

G. Open Sprinklers with Heat-Responsive Element Removed: UL 199.
   1. Characteristics:
      a. Nominal 1/2-inch Orifice: With Discharge Coefficient K between 5.3 and 5.8.

H. Sprinkler Finishes:
   1. Chrome plated.
   2. Bronze.

I. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
   1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
   2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

2.07 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with set screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with set screw or spring clips.

2.08 SLEEVES

A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

2.09 GROUT

A. Standard: ASTM C 1107, Grade B, post hardening and volume adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
   1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

E. Install sprinkler piping with drains for complete system drainage.

F. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

G. Provide 6” minimum clearance between top of light fixture and bottom of sprinkler piping.

H. Fill sprinkler system piping with water.

I. All sprinkler piping and pipe fittings shall be installed clean and free of rust. Rusted piping shall be cleaned, primed, and painted by the Contractor before system will be accepted.

J. Sprinkler piping installed above light fixtures shall have 6” minimum clearance between the top of the light fixture and the bottom of the pipe.

3.2 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than the existing system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. 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.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Pressure-Sealed Joints: Join light wall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

K. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

3.3 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of 2x2 acoustical ceiling panels or at quarter points in 2x4 ceiling panels.

3.4 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New and existing Piping:
   1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
   2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
   3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece or split casting, cast brass with polished chrome-plated finish.
   4. Bare Piping in Unfinished Service Spaces: One-piece, stamped steel with set screw or spring clips.

3.5 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in partitions and walls.

B. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

C. Install sleeves in new partitions, slabs, and walls as they are built.

D. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

E. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

F. Install sleeve materials according to the following applications:
   1. Sleeves for Piping Passing through Interior Concrete Walls:
      a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.

G. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 7 Section "Joint Sealants."

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   4. Energize circuits to electrical equipment and devices.
   5. Coordinate with fire-alarm tests. Operate as required.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 CLEANING

A. Clean rust, dirt and debris from sprinklers, sprinkler fittings, and sprinkler piping.

B. Remove and replace sprinklers with paint other than factory finish.

3.09 PAINTING

A. All sprinkler piping exposed to view in finished areas shall be cleaned and made ready for primer painting. Final painting shall be as directed by the Architect in areas where a higher level of exposed piping finish is required.

3.10 PIPING SCHEDULE

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be the following:
1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

B. Underground Service-Entrance Piping: Ductile-iron, mechanical joint pipe and fittings and restrained joints.

END OF SECTION 21 13 13

SECTION 220500
COMMON WORK RESULTS FOR PLUMBING

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. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Painting and finishing.
8. Concrete bases.
9. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and mechanical platform areas.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

D. No plumbing equipment or piping shall be located within 42" of electrical switchboards or panelboards.

E. No water piping (domestic, storm or sanitary) shall be located above electrical switchboards or panelboards.

1.7 CODES AND REGULATIONS

A. All materials and workmanship shall comply with the latest editions of the following codes and standards, as applicable:

Manufacturer's Standardization Society (MSS) Standard Practice (SP) 58: Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69: Pipe Hangers and Supports - Selection and Application

MSS SP-69: Pipe Hangers and Supports - Fabrication and Installation Practices

NFPA 101: Safety to Life from Fire in Buildings and Structures

National Electrical Code, 2017 Edition, with Georgia Amendments

International Mechanical Code, 2018 Edition, with Georgia Amendments

International Building Code, 2018 Edition, with Georgia Amendments

International Plumbing Code, 2018 Edition, with Georgia Amendments

International Fuel Gas Code, 2018 Edition, with Georgia Amendments

All local prevailing City and County codes

B. All workmanship and materials shall comply with all ordinances and regulations of all local authorities having jurisdiction.

C. Contractor shall obtain all permits and licenses, and pay all fees, as required for execution of the contract. Arrange for necessary inspections required by City, County, State and other authorities having jurisdiction, and deliver certificates of approval to the Owner. In compliance with the Georgia State Boiler Code, it is the responsibility of the Contractor (at his expense) to have each boiler and/or applicable pressure vessel inspected by a State of Georgia certified inspector upon installation of this equipment.

D. This inspection report shall be submitted to the Georgia Department of labor, Safety Engineering Section, 501 Pullman Street, Room 210, Atlanta, Georgia 30312, Attention Chief Safety Engineer.

E. Upon the Georgia Department of Labor review of the inspection report and their inspection, they will place a tag indicating the State Serial Number on the inspected piece of equipment and issue a certificate of boiler or pressure vessel inspection. The original certificate issued is to be posted in the mechanical room where the equipment is installed, with a copy sent to the Owner and one copy is to be included in the closeout documents.

1.8 RECORD DRAWINGS

A. As the work progresses, the Contractor shall maintain records and record all changes made daily on a set of contract mechanical drawings (HVAC, Plumbing & Fire Protection) during the progress of the work. The in-progress set of marked-up drawings, clearly showing the nature and extent of all changes, shall be maintained in the construction office at the site and clearly marked “Record Drawings”. The “Record Drawings” shall be up to date and available for use at time of any job site visit by the Engineer or Architect. The completed “Record Drawings” shall be turned over to the Architect upon completion and acceptance of the work. Final payment and “close-out” of the project shall be dependent upon receipt and acknowledgment of the completed “Record Drawings”.

B. The Contractor shall prepare electronic files in AutoCAD format of the Contract Drawings as As-Built record drawings of all changes made during the course of construction including all project addenda. Drawing changes shall be identified as follows:
   1. The affected change shall be identified in an enclosed clouded area of a consistent color not used to indicate the noted change.
   2. Each cloud shall have an identifier adjacent to the cloud identifying the date and origin of the change. (i.e., 1-12-06, Construction Directive, 1-12-06, Change Proposal, 1-12-06, Field Coordination, etc.).

C. Submittal for electronic Record Drawings shall be made on compact disk in AutoCAD format and accompany one (1) full size set of bond plots on white background. Plots shall be generated from the CD of electronic files. Electronic file names and plot sheet numbering shall match Contract Document format.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. 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 thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-soluble flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Available Manufacturers:
   a. Cascade Waterworks Mfg. Co.
   b. Dresser Industries, Inc.; DMD Div.
   c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
   d. JCM Industries.
   e. Smith-Blair, Inc.
   f. Viking Johnson.
2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
1. Available Manufacturers:
   a. Eslon Thermoplastics.
   b. Spears Mfg. Co.
   c. Georg Fischer Piping Systems - Doublesafe

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
1. Available Manufacturers:
   a. Thompson Plastics, Inc.
   b. Spears Mfg. Co.
   c. Georg Fischer Piping Systems - Doublesafe

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
1. Available Manufacturers:
   a. NIBCO INC.
   b. NIBCO, Inc.; Chemtrol Div.
   c. Spears Mfg. Co.
   d. Georg Fischer Piping Systems - Doublesafe

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
1. Available Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Eclipse, Inc.
   d. Epco Sales, Inc.

e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Available Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
1. Available Manufacturers:
a. Calpico, Inc.
b. Lochinvar Corp.
c. Watts Industries.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
1. Finish: Polished chrome-plated.

D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

E. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

2.9 MACHINERY GUARDS

A. Provide guards for moving equipment such as fan belt drives and motor drive couplings. Use OSHA approved belt guards and coupling guards. Provide 2 inch hole in guard at center of shaft of driven equipment where belt type drives are used.

2.10 BOLTED CONNECTIONS

A. Accurately punch, drill or ream bolt holes and remove burrs. Use washers, lock washers, and self-locking nuts as specified on Drawings, and as otherwise required. Tighten all bolts and nuts. Use screw threads conforming to National or Unified forms in accordance with Bureau of Standards Handbook H28. Do not use sheet metal screws. Use machine bolts where access or nuts would not be possible, and where unbolting may be required, in which case utilize sufficient thickness of metal to assure that 2 complete bolt threads are engaged. Secure machine bolts in place by proper lock washers.

2.11 MATERIALS FOR TESTING

A. All detergents, solvents and other cleaning shall be compatible with the materials of fabrication of the systems, in which they are used. They shall not adversely affect the materials or mechanisms in the system and they shall be acceptable to equipment manufacturers. All detergents, solvents and other cleaning agents shall also be compatible with the process streams to be handled by the system in which they are used.

B. Blinds, gaskets, bolts, etc., used in isolating segments of systems shall conform to the specification for adjacent materials.

C. Contractor shall furnish all labor, tools and equipment required for pressure testing piping systems.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. 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.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
      c. Insulated Piping: One-piece, stamped-steel type with spring clips.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
      f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

M. Sleeves are required for core-drilled holes.

N. Install steel pipe sleeves for pipes passing through concrete and masonry walls to extend 1” beyond wall on both sides and concrete floor and roof slabs as described below.

O. Install sleeves for pipes passing through gypsum-board partitions.
   1. Cut sleeves to length for mounting in walls to extend a minimum of 1” beyond wall on both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
   3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
      a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
      b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Fire Stopping” and "Fire Resistive Joints” for materials and installation.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using steel pipe sleeves. Select sleeve size to allow for 1/4" annular clear space between pipe and sleeve.
   1. Install steel pipe for sleeves smaller than 10 inches in diameter.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Sections "Penetration Fire Stopping" and "Fire-Resistive Joint System".

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-soluble 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.

E. 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.

F. 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.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic 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. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
   3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   4. PVC Non-pressure Piping: Join according to ASTM D 2855.
   5. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
   4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

E. All equipment shall be installed in strict conformance with manufacturer's recommendations, as specified herein and as shown.

F. All work provided under this Division shall be installed under the direct supervision of contractors licensed by the State of Georgia.

G. Plumbing work shall be under the direct supervision of a licensed Master Plumber, Class II.

H. The supervising license holders shall be identified, and a copy of their current valid license shall be provided as part of the initial submittal package.

I. Where piping or equipment is exposed to view, special attention shall be given to pipe routing and installation, and the finished installation shall be neat and workmanlike, straight and parallel or perpendicular to the building construction. Piping exposed to view shall be primed and painted as directed by the Architect.

J. All welders shall be qualified by an independent testing agency and certified in accordance with the requirements of ASME Section IX of the Boiler and Pressure Vessel Code. Contractor shall furnish certification of welder’s qualifications with shop drawings.

3.5 ELECTRICAL WORK

A. All electrical equipment provided under this Division shall comply with the electrical system characteristics present on the site and specified in Division 26.

B. Motor controls, system controls, starters, pilot lights, push buttons, etc., shall be furnished complete as part of a motor apparatus which it operates, except starters located in the motor control center. All components shall be in conformance with the requirements of the National Electrical Code (2017 Edition) and Division 26.

C. All power wiring and final connections to the system shall be provided under Division 26.

3.6 PRODUCT HANDLING, DELIVERY AND STORAGE

A. Receive and handle all materials with care so as not to cause damage. Use padded or strap slings, etc., as appropriate for materials being handled. Lift equipment by lift points provided or recommended by manufacturer.

B. Use proper tools, equipment and procedures to handle and lay pipe. Do not damage pipe coating, wrapping or linings. Repair or replace damaged pipe coatings, wrappings, or linings in accordance with manufacturer's instructions or as required to restore original protection.

C. Inspect all materials, upon receipt, for defects and for compliance with Specifications.

D. Properly store all equipment, pipe, piping materials, etc., so as to prevent deterioration while in storage. Store all materials off ground or off floor. Store inside or cover all materials subject to deterioration from weather.

E. Store loose materials such as fittings, gaskets, bolts, nuts, small valves, traps, and specialties in adequate number of bins to properly separate. Protect ends of large fittings, valves and pipe from weather and abuse. Properly grease all machined surfaces.

3.7 PAINTING

A. Factory painted equipment that has been scratched or marred shall be repainted to match original factory color.

B. Field painting of all uninsulated black ferrous metal items exposed to sight such as equipment hangers, piping, frames and supports not provided with factory prime coat, shall be cleaned and painted with one coat of rust inhibiting primer. In addition, such items in finished spaces shall also be painted with two coats of finish paint in a color to match adjacent surfaces or as otherwise selected by the Architect. Comply with requirements for painting in Division 9, Section "Painting".

C. All exterior gas piping exposed to view, at meters, emergency generators and on the roof shall be primed at the time of installation with two coats of rust prohibitive primer. Final painting shall be done after testing is completed and prior to system being placed in service. See Division 9, Section "Painting" for requirements.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 CLEANING AND ADJUSTING

A. The exterior surfaces of all plumbing equipment, fixtures, fittings, piping, etc., shall be cleaned of all grease, oil, paint and other construction debris.

B. Start-up and adjustment of all water heaters shall be performed by certified factory representatives of the respective equipment manufacturer.

C. Equipment controls and other accessories shall be adjusted to provide optimal and efficient operation.

3.9 TESTING

A. Concealed or insulated piping shall be tested in place before concealing, insulating or covering.

B. Equipment, materials and instruments required for tests shall be furnished without incurring additions to the Contract.

C. Refer to the individual specification sections for specific testing requirements regarding that item.

3.10 ELECTRONIC FILES FOR COORDINATION AND SHOP DRAWING DEVELOPMENT

A. Contractor shall obtain from the Architect a copy of the project architectural/structural/HVAC model for coordination and preparation of the Plumbing piping systems installation shop drawings. Contractor shall also obtain a set of the Fire/Sprinkler and HVAC ductwork shop drawings and shall coordinate all divisions of work into the submittal for review.

B. Should the Contractor be unable to resolve any conflicts regarding location and routing of the plumbing system components, the Contractor shall notify the Architect immediately upon discovery. Contractor shall not proceed with installation, fabrication, or purchase of the associated plumbing components until the conflicts are resolved.

3.11 SHOP DRAWINGS

A. Submit a minimum of three hard copy sets of shop drawings along with an electronic formatted submittal for approval prior to commencing work. Hard copy shop drawings shall be bound in a three-ring binder and shall include an index page with each item listed and referenced to sections with tabs. Tabs shall be cross referenced to index page. All shop drawings shall be prepared and submitted as a single package. **NO SHOP DRAWINGS WILL BE CHECKED UNTIL ALL HAVE BEEN SUBMITTED.** (HVAC controls submittals and any items with exceptionally long lead times that may affect the project completion date, as determined by the Engineer may be submitted separately). **Electronic shop drawings shall be a single PDF file and formatted as required for hard copy submittals. Each section shall be a bookmarked (tabbed) link named to describe the section and cross referenced to index. (ELECTRONIC SHOP DRAWINGS NOT PROPERLY FORMATTED WILL BE RETURNED UNCHECKED.)**

B. The following format shall be followed:
   1. The submittal cover sheet shall include-
      Project Name
      Type of Shop Drawing including trade (HVAC, Plumbing, Fire Protection)
      Mechanical Contractor’s Company Name
      Date of Submittal

2. The first sheet inside the submittal shall include all items on the cover sheet plus the following-
   Owner
   Architect
   Engineer
   Mechanical Contractor's Project Manager's Name
3. The supervising license holder(s) shall be identified, and a copy of their current valid license shall be included.
4. The second sheet shall include the following typed statement, signed and dated by the mechanical contractor's project manager-

   "The enclosed submittal (shop drawings) has been reviewed for accuracy of equipment and system quality and component quantities. The available voltages have been coordinated with the electrical contractor. All coordination items with other trades have been completed including structural, electrical, and other mechanical division disciplines prior to ordering any equipment."

C. The Contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the Engineer and shall include the form (found at the end of this section), Exhibit 1, entitled "Certification of Compliance - Shop Drawings" with each submittal prior to the index page and submittal data sheets. **Failure to complete and execute this form will result in rejection of the submittal without review.**

D. Each individual submittal item shall be marked to show Specifications Section and Paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc. with all options and/or accessories clearly marked, so that the intended use of the equipment can be readily identified. Failure to mark the submittals accordingly shall be considered cause for rejection of shop drawings.

E. Submittals shall be supported by descriptive material, such as catalog cuts, diagrams, certified performance curves and charts published by the manufacturer to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. All literature shall clearly indicate the specified model number, options to be included, dimensions, arrangement, rating and characteristics of the proposed equipment. Capacities and ratings shall be based on conditions indicated or specified herein. Any deviations from specified equipment shall be clearly noted in red.

F. The Engineer will review the shop drawings for errors in the Contractor's interpretation of the design intent only. Corrections or comments made on shop drawings during review shall not relieve the Contractor from compliance with requirements of the Contract Documents, plans and specifications. Review of shop drawings shall not relieve the Contractor from the responsibility for conforming and correlating all quantities and dimensions, coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.

G. Review of shop drawings shall not permit any deviations from the plans and specifications nor shall it permit changes to the plans and specifications by the Engineer. Changes to or deviations from the Contract Documents are subject to the provisions of the General Conditions of the contract. Any required changes will then be issued by the Architect and executed by both the Owner and Contractor.

H. Each individual submittal item shall be marked to show Specifications Section and paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc., so that the intended use of the equipment can be readily identified. Shop drawings shall be submitted for each of the following items:
1. Thermometers
2. Pressure Gauges
3. Pipe Insulation & Accessories
4. Pipe and Pipe Fittings
5. Pipe Identification Systems
6. Relief Valves
7. Pipe Accessories
8. Pipe Hangers, Supports & Accessories
9. Plumbing Fixtures & Fittings
10. Valves & Unions
11. Cleanouts & Accessories
12. Shock Arrestors
13. Access Covers & Panels
14. Valve Schedules and Diagrams
15. Wall Hydrants & NFWH's
16. Floor Drains
17. Gauges
18. Sheet Lead Flashing

I. For miscellaneous items not listed here, Contractor shall submit shop drawings for approval, unless the item is to be provided and installed **exactly** as specified, without variance.

J. Submit evidence of welders' qualifications prior to performing any welds.

3.12 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete".

3.13 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.14 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.15 CONSTRUCTION OBSERVATION

A. Give Architect 2 days notice of all tests and observations.

B. Conduct all tests to satisfaction of Architect or his authorized representative.

C. Make site available at all times for observation by Architect. Contractor shall uncover all concealed areas during construction observation.

D. In addition, the following formal observations by Architect or his authorized representative shall be conducted for each building or part of building and site.
   1. Above floor work before being concealed or covered.
   2. Final observation after completion of work.

3.16 FLASHING

A. All pipe passing through a roof shall be flashed in an approved manner. Flashing shall be perfectly watertight. Flashing shall be provided under this sub-contract, for installation under the roofing division. Sheet lead flashing shall be minimum 6.0 lb. per square foot, with

adjustable flashing boot, with minimum 30" square. Lead sanitary vent flashings shall be smoothly shaped and formed into the pipe penetrations to the full available maximum inside diameter of the pipe. The roof penetration/flashing system shall be coordinated and compatible with roofing manufacturers' system. Comply with requirements of Division 7, Section "Thermal and Moisture Protection" for penetration of roofing systems.

3.17 FREEZE PROTECTION

A. Do not run piping in outside walls, ventilated attic or ceiling spaces, or in other locations subject to freezing conditions. Piping adjacent to exterior walls shall be in furred spaces or cavities, on the warm side of the building insulation barrier, with building insulation between the piping and the exterior wall. In attic or ceiling spaces, piping shall be on the warm side of insulation batts. Insulation of piping in and of itself shall not be considered adequate freeze protection. Domestic water piping or non-potable water piping exposed to freezing conditions shall be insulated as specified, with aluminum weather jacket and electric heating cable, thermostatically controlled.

3.18 CLOSEOUT DOCUMENTATION

A. Close out completion shall be dependent upon satisfactory submittal of the following documents related to this contract:
   1. Permits and Certificates of Inspection.
   2. Statement certifying that no systems, components or materials employed on the project contain asbestos in any form.
   3. Statement certifying that no flux, solder or fittings employed on the project contain lead.
   4. Certification of Owners personnel instruction.
   5. Evidence of Welders qualifications under ASME SECTION IX of the Pressure Vessels Code, with attached affidavit that all welds were made by certified personnel.
   6. Certification by the Local Health Department that potable water systems have been tested and satisfactorily sterilized. Submittal of this certificate shall be made prior to substantial completion.
   7. Certificate of Insulation Compliance.

B. Reference Division I - Section "Project Closeout" for general requirements.

3.19 PROJECT RECORD DOCUMENTS

A. Record drawings shall be submitted that incorporate all changes to the contract, pre-bid and post-bid. Reference each specification section for the required manuals.

B. Reference Division 1 - Section "Project Closeout" for general requirements.

3.20 OPERATION AND MAINTENANCE DATA

A. Operation and maintenance manuals shall be submitted for all major plumbing equipment. Reference each specification section for the required manuals.

B. Reference Division 1 - Section “Project Closeout” for general requirements.

END OF SECTION 220500

CERTIFICATION OF COMPLIANCE - PRIOR APPROVAL REQUEST

To: _____

Project: _____

I have reviewed the contract documents, including but not limited to specifications, drawings, and addenda. To the best of my knowledge the enclosed submittals (circle the appropriate statement); 1) are consistent with and meet the requirements of the aforementioned documents, or 2) are consistent with and meet the requirements of the aforementioned documents with the following exceptions (attach additional pages if necessary):

I further recognize that; 1) the Engineers review is for general conformance with the design concept and with the information given in the contract documents, 2) approval of the submittals, by the engineer, unless specifically noted is for "manufacturer only" and specific requirements shall be as specified, including standard specifications as listed in the manufacturer's data for the actual product specified, 3) approval of the submittals shall in no way be construed to permit any deviations from plans and specifications.

To the best of my knowledge, substitution of the enclosed items will (circle the appropriate statement) 1) not require any modifications to any other element of the project, or 2) require the following modifications (attach additional pages if necessary):

I Understand that I will be required to remove and replace at no additional cost to the Owner any item found to be inconsistent with or not meet the requirements of the aforementioned documents.

The undersigned states that the above is true to the best of his knowledge and that his has the authority to legally bind his firm to the above terms. Failure to provide a legally binding signature shall void the prior approval request.

By: _____ Date: _____

Title: _____

Company: _____

SECTION 22 0500 - Exhibit No. 2

CERTIFICATION OF COMPLIANCE - SHOP DRAWINGS

To_____

Project: _____

I have reviewed the contract documents, including but not limited to specifications, drawings, addenda, and change orders. To the best of my knowledge the materials described by the enclosed shop drawings are consistent with and meet the requirements of the aforementioned documents. I further recognize that; 1) the Engineers review is to assist me in complying with the documents by checking for errors in my interpretation of the requirements set forth in the contract documents, 2) review of shop drawings, by the Engineer, shall not relieve me of my responsibility for confirming and correlating all quantities, dimensions and work with that of other trades, and for performing the work in a safe and satisfactory manner, and 3) review of shop drawings, by the Engineer, shall not permit any deviations from plans and specifications.

I understand that I will be required to remove and replace at no additional cost to the Owner any item found to be inconsistent with or not meet the requirements of the contract documents.

The undersigned states that the above is true to the best of his knowledge and that he has the authority to legally bind his firm to the above terms. Failure to provide a legally binding signature shall void submittal.

Sub Contractor:

By:_____ Date:_____

Ga. State License No (Required). _____

Title: _____

Company: _____

General Contractor:

By:_____ Date: _____

Title: _____

Company: _____

SECTION 220519
METERS AND GAGES

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 meters and gages for mechanical systems:
   1. Thermometers.
   2. Pressure gages.
   3. Test plugs.

B. Related Sections include the following:
   1. Division 22 Section "Domestic Water Piping" for domestic water service meters inside the building.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

B. Shop Drawings: Schedule for thermometers and gages indicating manufacturer's number, scale range, and location for each.

C. Operation and Maintenance Data: To include in operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
2. Thermometer Test Wells: Wells shall be brass and as specified above and designed to accept either dial thermometer as specified above or test thermometer.
3. Manufacturers: Trerice #L80030, Ashcroft, Weis, Moeller, Marsh, Weksler, Palmer, or approved equal.

2.2 BIMETALLIC-ACTUATED DIAL THERMOMETERS

A. Manufacturers:
1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Ernst Gage Co.
3. Trerice, H. O. Co.
4. Weiss Instruments, Inc.
5. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Description: Direct-mounting, bimetallic-actuated dial thermometers complying with ASME B40.3.

C. Element: Bimetal coil.

D. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Pointer: Red metal.

F. Window: Glass.

G. Ring: Stainless steel.

H. Connector: Adjustable angle type.

I. Stem: Metal, for thermowell installation and of length to suit installation.

J. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

K. Ranges: Manufacturer's standard comparable to the following:
Domestic Hot Water 30 to 240 degrees F

2.3 THERMOWELLS

A. Manufacturers: Same as manufacturer of thermometer being used.

B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.4 PRESSURE GAGES

A. Manufacturers:
1. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.
2. Ernst Gage Co.
3. Trerice, H. O. Co.
4. Weiss Instruments, Inc.
5. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.
1. Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red metal.
7. Window: Glass.
8. Ring: Stainless steel.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:
1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Syphons: NPS 1/4 coil of brass tubing with threaded ends.
3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.5 TEST PLUGS/PORTS

A. Manufacturers:
1. Flow Design, Inc.
2. Trerice, H. O. Co.
3. Superseal, Peterson

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: The test plug shall be constructed of brass with neoprene valve core rated for 1000 psi working pressure and designed for screwed installation in a 1/4" (Female) half collar welded to pipe or container

D. Core Inserts: One or two self-sealing rubber valves.
1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install bimetallic-actuated dial thermometers in the following locations:
   1. Outlet of each domestic water heater.
   2. Install additional thermometers as indicated on the drawings.

B. Provide the following temperature ranges for thermometers:
   1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install additional gages as indicated on the drawings.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install needle-valve and snubber fitting in piping for each pressure gage for fluids (except steam).

E. Install test plugs in tees in piping.

F. Install connection fittings for attachment to portable indicators in accessible locations.

3.4 CONNECTIONS

A. Install gages adjacent to equipment to allow service and maintenance for gages and equipment.

3.5 ADJUSTING

A. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION 220519

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

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 SUMMARY

A. This Section includes the following general-duty valves:
1. Bronze angle valves.
2. Copper-alloy ball valves.
3. Ferrous-alloy ball valves.
4. Bronze check valves.
5. Gray-iron swing check valves.
6. Ferrous-alloy wafer check valves.
7. Spring-loaded, lift-disc check valves.

B. Related Sections include the following:
1. Division 2 piping Sections for general-duty and specialty valves for site construction piping.
2. Division 22 piping Sections for specialty valves applicable to those Sections only.

1.3 DEFINITIONS

A. The following are standard abbreviations for valves:
1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene terpolymer rubber.
3. NBR: Acrylonitrile-butadiene rubber.
4. PTFE: Polytetrafluoroethylene plastic.
5. SWP: Steam working pressure.
6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include

rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.
   1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 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 angle, gate, and globe valves closed to prevent rattling.
   4. Set ball valves open to minimize exposure of functional surfaces.
   5. Block check valves in either closed or open position.

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 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:
1. Hand wheel: For valves other than quarter-turn types.
2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
1. Valve Grooved Ends: AWWA C606.
2. Solder Joint: With sockets according to ASME B16.18.
a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.
3. Threaded: With threads according to ASME B1.20.1.

I. Valve Bypass and Drain Connections: MSS SP-45.

2.3 BRONZE ANGLE VALVES

A. Available Manufacturers:
1. Type 1, Bronze Angle Valves with Metal Disc:
a. Crane Co.; Crane Valve Group; Stockham Div.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
2. Type 2, Bronze Angle Valves with Nonmetallic Disc:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Anvil International.
e. Hammond Valve.
f. NIBCO INC.
3. Type 3, Bronze Angle Valves with Metal Disc and Renewable Seat:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Anvil International.
e. Milwaukee Valve Company.

B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

C. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.

D. Type 2, Class 150, Bronze Angle Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.

E. Type 3, Class 150, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

2.4 COPPER-ALLOY BALL VALVES

A. Available Manufacturers:
   1. Two-Piece, Copper-Alloy Ball Valves:
      a. Conbraco Industries, Inc.; Apollo Div.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Jenkins Valves.
      d. Crane Co.; Crane Valve Group; Stockham Div.
      e. Anvil International.
      f. Hammond Valve.
      g. Milwaukee Valve Company.
      h. Watts Industries, Inc.; Water Products Div.
      i. Kitz Valve Company

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

2.5 FERROUS-ALLOY BALL VALVES

A. Available Manufacturers:
   1. Conbraco Industries, Inc.; Apollo Div.
   2. Cooper Cameron Corp.; Cooper Cameron Valves Div.
   3. Crane Co.; Crane Valve Group; Stockham Div.
   4. Hammond Valve.
   5. Milwaukee Valve Company.

B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

C. Ferrous-Alloy Ball Valves: Class 300, full port.

2.6 BRONZE CHECK VALVES

A. Manufacturers:
   1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
      a. Cincinnati Valve Co.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Stockham Div.
      d. Walworth Co.

2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
   a. Cincinnati Valve Co.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
3. Type 3, Bronze, Swing Check Valves with Metal Disc:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. Anvil International.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. Powell, Wm. Co.
   h. Walworth Co.
   i. Watts Industries, Inc.; Water Products Div.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

D. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

E. Type 2, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

F. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.

G. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

H. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.7 GRAY-IRON SWING CHECK VALVES

A. Manufacturers:
1. Type I, Gray-Iron Swing Check Valves with Metal Seats:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. Anvil International.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. Mueller Co.
   h. Watts Industries, Inc.; Water Products Div.
2. Type II, Gray-Iron Swing Check Valves with Composition to Metal Seats:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Div.

c. Mueller Co.
d. Watts Industries, Inc.; Water Products Div.

B. Gray-Iron Swing Check Valves, General: MSS SP-71.

C. Type I, Class 250, gray-iron, swing check valves with metal seats.

D. Type II, Class 250, gray-iron, swing check valves with composition to metal seats.

2.8 FERROUS-ALLOY WAFER CHECK VALVES

A. Manufacturers:
1. Single-Plate, Ferrous-Alloy, Wafer Check Valves:
a. McWane, Inc.; Kennedy Valve Div.
b. Mueller Co.
c. Tyco International, Ltd.; Tyco Valves & Controls.
2. Dual-Plate, Ferrous-Alloy, Wafer Check Valves:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Div.
c. Anvil International.
d. Watts Industries, Inc.; Water Products Div.
3. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Gulf Valve Co.
c. Valve and Primer Corp.
4. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Gulf Valve Co.
c. Techno Corp.

B. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

C. Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.

D. Single-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

E. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

2.9 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Manufacturers:
1. Type I, Wafer Lift-Disc Check Valves:
a. Mueller Steam Specialty.
2. Type II, Compact-Wafer, Lift-Disc Check Valves:
a. Anvil International.

b. Hammond Valve.
c. Metraflex Co.
d. Milwaukee Valve Company.

3. Type III, Globe Lift-Disc Check Valves:
   a. Anvil International.
   b. Hammond Valve.
   c. Metraflex Co.
   d. Milwaukee Valve Company.
4. Type IV, Threaded Lift-Disc Check Valves:
   a. Anvil International.
   b. Metraflex Co.
   c. Milwaukee Valve Company.
   d. Watts Industries, Inc.; Water Products Div.

B. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.

C. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.

D. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

E. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.

F. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. 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.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. 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.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball valves.
   2. Throttling Service: Angle or ball valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:
   1. Angle Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
   2. Angle Valves, NPS 2-1/2 and Larger: Type II, Class 250, cast iron.
   3. Ball Valves, NPS 2 and Smaller: Two-piece, 400-psig CWP rating, copper alloy.
   4. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
   5. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 150, horizontal, bronze.
   6. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
   7. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 250, gray iron.
   8. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 150.
   9. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type I or II, Class 250, cast iron.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.

G. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-soluble, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 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.

END OF SECTION 220523

SECTION 220529

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for mechanical system piping and equipment:
   1. Steel pipe hangers and supports.
   2. Metal framing systems.
   3. Fastener systems.
   4. Equipment supports.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry Inc

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Steel pipe hangers and supports.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Metal framing systems. Include Product Data for components.
      a. Equipment supports.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.3, "Structural Welding Code--Sheet Steel." AWS D1.4, "Structural Welding Code--Reinforcing Steel. "ASME Boiler and Pressure Vessel Code: Section IX.

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.2, "Structural Welding Code--Aluminum."
   3. AWS D1.3, "Structural Welding Code--Sheet Steel."
   4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
   5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:
   1. B-Line Systems, Inc.; a division of Cooper Industries.
   2. ERICO/Michigan Hanger Co.
   3. Grinnell Corp.
   4. PHD Manufacturing, Inc.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:
1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.4 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers:
2. B-Line Systems, Inc.; a division of Cooper Industries.
3. Hilti, Inc.
4. Powers Fasteners.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes. All supplementary supporting steel for work under this Division shall be provided under this Division of the specifications in accordance with the plans and accepted practices.

2.6 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Low type, manufactured pipe stand assembly consisting of a plastic base unit with two vertical 1/2" galvanized threaded steel rods with nuts and washers adjustable to 10" minimum and horizontal roller strut support with contours for supporting pipe.

2.7 Manufacturers:

A. MIRO Industries 4-RAH.

B. PHP Systems and Design SS8-R.

C. Mapa Products MS-5.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, 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: Non-staining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified 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 padded hangers for piping that is subject to scratching.

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 non-insulated or insulated stationary pipes, NPS 1/2 to NPS 8.

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 10.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

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. C-Clamps (MSS Type 23): For structural shapes.
6. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
7. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
8. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

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.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. SUSPENDED HORIZONTAL PIPING

1. Support Spacing:

NOMINAL PIPE SIZE	MATERIAL	MAXIMUM SPACING OF SUPPORTS B FT.
Up through 1-1/2"	Steel & Copper	6'-0"
2" through 8"	Steel & Copper	8'-0"
3" through 5"	Cast Iron	5'-0"
6" and above	Cast Iron	5'-0"
All sizes	Plastic	4'-0"

2. In addition to the above maximum spacing requirements, hangers and supports shall be installed within 18" of each change in direction, regardless of pipe size or material.
3. Provide all hangers and rods, turnbuckles, angles, channels and other structural supports to support the piping systems. Rods for pipe hangers shall be as follows:

HANGER ROD DIAMETER	PIPE SIZE
3/8"	2" and smaller
1/2"	2-1/2" and 3"
5/8"	4" and 5"
3/4"	6"

4. Intermediate pipe supports provided between building structural members so as not to exceed maximum support spacing specified from top chord of framing joist shall be structural steel angles (minimum 2-1/2" X 2-1/2" X 1/4").
5. All ferrous metal pipe hangers and supplemental steel shall be provided with factory applied coat of rust inhibitive paint, plating or galvanizing.
6. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation, and the pipe insulation protective shields.
    a. Cold water piping
    b. Domestic hot water supply and recirculating piping
7. Adjustable swivel ring type hangers are not acceptable.
8. All supporting equipment shall be designed with a minimum factor of safety of five based on the ultimate tensile strength of the materials employed.
9. Steel 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 building structure.
10. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
11. Fastener System Installation:
    a. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.\
12. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
13. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
14. 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.
15. Install lateral bracing with pipe hangers and supports to prevent swaying.
16. 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.
17. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
18. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
19. Insulated Piping: Comply with the following:
    a. Attach clamps and spacers to piping.
    b. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    c. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    d. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
    e. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    f. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
20. Shield Dimensions for Pipe:
    a. Provide galvanized sheet metal pipe insulation protection shields at each pipe hanger for all horizontal insulated water pipes and condensate drain pipes. Shield sizes shall be:

b. Pipes 2" and smaller: 18 gauge X 12" long
c. Pipes 2-1/2" and larger: 16 gauge X 18" long
d. Shields shall be 180 degree type at all pipe hangers, except that on trapeze hangers, pipe rack and on floor supported horizontal pipe shields shall be 360 degree type. For pipe sizes 2-1/2" and larger, use Foam glass inserts at all shields, hangers, sleeves, etc.
e. Pipes NPS 2-1/2" and Larger: Include wood or foam glass inserts.
f. Insert Material: Length at least as long as protective shield.

3.3 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 smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 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 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 contours of welded surfaces match adjacent contours.

3.5 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.

3.6 PAINTING

A. Touch Up: 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. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 220553

IDENTIFICATION 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:
1. Equipment labels.
2. Pipe markers.
3. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Valve numbering scheme.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

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 location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Labels: 2" high black film adhesive backed letters.
   1. Data:
      a. Name and plan number.
   2. Location: Accessible and visible.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
   1. Colors: Comply with ASME A13.1, unless otherwise indicated.
   2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
   3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
   4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
   5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Self-Adhesive Pipe Markers not acceptable.

C. Plastic Tape not acceptable.

D. Acceptable Manufacturers:
   1. T&B/ Westline
   2. Seton
   3. MSI (Marking Services, Inc.)
   4. Brimar Identification & Safety Products
   5. Brady

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
   1. Material: 19 gauge minimum, brass, 1-1/2" minimum size.
   2. Valve-Tag Fasteners: Self locking cable ties.

B. Acceptable Manufacturers:
   1. T&B/ Westline
   2. Seton
   3. MSI (Marking Services, Inc.)
   4. Brimar Identification & Safety Products

5. Brady

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 22 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
   1. Pipes with OD, Including Insulation, Less Than 4 Inches: Snap-on/self-coiling pipe markers. Use color-coded markers lapped at least 1-1/2 inches at both ends of pipe marker and covering full circumference of pipe.
   2. Pipes with OD, Including Insulation, 4 Inches and Larger: Snap-on/self coiling pipe markers. Use color-coded markers with permanent nylon fastener straps, one on each end.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 20 feet along each run or otherwise at each wall.
   7. Pipe markings on piping more than 7'-0" above floor shall be rotated to allow full observation from floor.

C. Band and letter sizes shall conform to the following table:

O.D. of Piping of Covering:	Width of Color Band	Size of Letter/Numbers
1" and smaller	6"	1/2"
1-1/4" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" and larger	18"	2"

D. Band legend and color and letter color shall conform to the following table:

Piping	Band Legend	Letters	Band Color
Non-potable Water	NPW	Black	Green
Domestic Cold-Water	CW	Black	Green
Domestic Hot Water	HW	Black	Yellow
Domestic Circulating HW	HWC	Black	Yellow
Natural Gas	G	Black	Yellow

Medium Pressure Gas	MPG	Black	Yellow

3.3 VALVE-TAG INSTALLATION

A. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

SYSTEM	IDENTIFICATION SHAPE	NUMBERS
Cold Water (Domestic)	Round	CW-1,2,3.....
Hot Water (Domestic)	Round	HW-1,2,3.....

a. Each valve tag shall be attached to the hand wheel or lever handle with jack chain or “S” hooks.

b. A valve chart, framed under glass and wall mounted, shall be located in the main mechanical room and shall list each valve by identification number, its location in the piping system - (i.e., hot water, fire main, water heater, etc.) and its function - (i.e., shut-off, balancing, drain, etc.).

c. Gas valves at the meter, emergency gas generator, and on the roof, shall not have valve tags or pipe identification.

d. All ceiling tiles which provide access to valves shall be identified with a color-coded valve identification number or a clear adhesive backed label maker stencil with 3/8” minimum high black lettering to be affixed to the permanent ceiling grid immediately below the valve.

3.4 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.5 CLEANING

A. Clean faces of mechanical identification devices.

END OF SECTION 220553

SECTION 220700
PLUMBING INSULATION

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 plumbing insulation for equipment and pipe, including the following:
   1. Insulation Materials:
      a. Cellular glass.
      b. Flexible elastomeric.
      c. Mineral fiber.
      d. Polyolefin.
   2. Adhesives.
   3. Mastics.
   4. Sealants.
   5. Factory-applied jackets.
   6. Field-applied fabric-reinforcing mesh.
   7. Field-applied jackets.
   8. Tapes.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. SSL: Self-sealing lap.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Insulation application at pipe expansion joints for each type of insulation.
3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Removable insulation at piping specialties, equipment connections, and access panels.
5. Application of field-applied jackets.
6. Application at linkages of control devices.
7. Field application for each equipment type.

C. 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.

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.

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 size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment".

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment 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 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about 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 Part 2 "Factory-Applied Jackets" Article.
   1. Products:
   2. Cell-U-Foam Corporation; Ultra-CUF.
   3. Pittsburgh Corning Corporation; Foamglas Super K.
   4. Block Insulation: ASTM C 552, Type I.
   5. Special-Shaped Insulation: ASTM C 552, Type III.
   6. Board Insulation: ASTM C 552, Type IV.
      Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
   7. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
   8. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
   1. Products:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. Mineral-Fiber, Preformed Pipe Insulation:
1. Products:
a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.
2. 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 Part 2 "Factory-Applied Jackets" Article.

I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
1. Products:
a. Armacell LLC; Tubolit.
b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.
c. RBX Corporation; Therma-cell.

J. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type III with factor-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements:
a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

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. Cellular-Glass, Phenolic-Foam, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
1. Products:
a. Childers Products, Division of ITW; CP-96.
b. Foster Products Corporation, H. B. Fuller Company; 81-33.
c. Pittsburgh-Corning

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Products:
a. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.

c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products:
a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

E. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products:
a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Red Devil, Inc.; Celulon Ultra Clear.
e. Speedline Corporation; Speedline Vinyl Adhesive.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
1. Products:
a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.
e. Mon-Eco Industries, Inc.; 55-40.
f. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96, 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, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:
1. Joint Sealants for Cellular-Glass Products:
a. Childers Products, Division of ITW; CP-76.
b. Foster Products Corporation, H. B. Fuller Company; 30-45.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

f. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F .
5. Color: White or gray.

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) FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. 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) Products:
      (a) Johns Manville; Zeston.
      (b) P.I.C. Plastics, Inc.; FG Series.
      (c) Proto PVC Corporation; LoSmoke.
      (d) Speedline Corporation; SmokeSafe.
   (2) Adhesive: As recommended by jacket material manufacturer.
   (3) 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.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
   (1) Products:
      (a) Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.

(b) Compac Corp.; 104 and 105.
(c) Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

(2) Width: 3 inches.
(3) Thickness: 11.5 mils.
(4) Adhesion: 90 ounces force/inch in width.
(5) Elongation: 2 percent.
(6) Tensile Strength: 40 lbf/inch in width.
(7) ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.10 FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

A. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
1. Products: Subject to compliance with requirements:
a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
e. Width: 3 inches.
f. Thickness: 6.5 mils.
g. Adhesion: 90 ounces force/inch in width.
h. Elongation: 2 percent.
i. Tensile Strength: 40 lbf/inch in width.
j. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
k. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

B. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
1. Products: Subject to compliance with requirements:
a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 3520 CW.
e. Width: 2 inches.
f. Thickness: 3.7 mils.
g. Adhesion: 100 ounces force/inch in width.
h. Elongation: 5 percent.
i. Tensile Strength: 34 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
   1. Verify that systems and equipment 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) Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F 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 COMMON INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and 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
   4. Insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   5. 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.
   4. For below ambient services, apply vapor-barrier mastic over staples.
   5. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
   6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. All domestic water piping in walls and chases shall be insulated unless otherwise noted on plans.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Firestopping and fire-resistive joint sealers are specified in Division 7 Sections "Penetration Fire Stopping" and "Fire-Resistive Joint System".

C. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies according to Division 7 Section "Penetration Fire Stopping".

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 and equipment. 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 CELLULAR-GLASS INSULATION INSTALLATION

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.
For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.

3. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but 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, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material and density 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 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturers’ 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 manufacturers’ 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 MINERAL-FIBER INSULATION INSTALLATION

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 but 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.

E. Blanket Insulation Installation on rainwater, downspout and overflow drain piping and sumps: Secure with FSK tape and wire at 36" intervals along entire horizontal run of insulation. Secure roof drain sump insulation with FSK tape. All metal surfaces of roof drain body, inclusive of under deck clamps shall be insulated.
   1. Tape applied to longitudinal seams shall be continuous.
   2. Horizontal downspout and overflow drain piping shall be insulated from underside of roof deck to 12" beyond elbow turned down in wall or chase.

3.9 POLYOLEFIN INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Seal split-tube longitudinal seams and end joints with manufacturers' 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 polyolefin sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturers' 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. mitered sections of polyolefin 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 cut sections of polyolefin pipe and sheet 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.
   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.

3.10 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; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturers' 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.

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-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section.
3. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
4. 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.
5. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch-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.
6. 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.

3.11 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.
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.

3.12 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. Below-grade piping. (Except copper piping shall have protective sleeve or coating).
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
3. Pipe risers to water hammer arrestors/shock absorbers above ceiling.
4. Trap Primer piping from distribution unit to drains on traps.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water: Less than 1-1/2": Insulation shall be the following:
1. Copper piping: Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
2. CPVC piping: Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
3. CPVC piping in masonry walls and chases: Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials, 1/2 inch thick.

B. Domestic Cold Water: Less than 8”: Insulation shall be the following:
1. Copper piping: Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
2. CPVC piping: Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
3. CPVC piping in masonry walls and chases: Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials, 1 inch thick.

C. Domestic Hot and Recirculated Hot Water: Less than 1-1/2”: Insulation shall be the following:
1. Copper piping: Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
2. CPVC piping: Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
3. CPVC piping in masonry walls and chases: Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials, 1inch thick.

D. Domestic Hot and Recirculated Hot Water: Less than 8”: Insulation shall be the following:
1. Copper piping: Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.
2. CPVC piping: Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.
3. CPVC piping in masonry walls and chases: Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials, 1-1/2 inch thick

E. Condensate and Equipment Drain Water below 60 Deg F:
1. Less than 1-1/2”: Insulation shall be the following:
a. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
2. Less than 8”: Insulation shall be the following:
a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

F. Overhead Floor Drains, Traps, and Sanitary Drain Piping within 5 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F.

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 1 inch thick.
   b. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

G. Rainwater/Downspout and Overflow drain piping above ceilings inclusive of roof and overflow drain sumps.
1. All pipe sizes: Insulation shall be the following:
   a. Blanket fiberglass insulation 1-1/2" thick.

3.14 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.
1. Piping, Exposed:
   a. PVC: 20 mils thick.
   b. Aluminum, smooth or corrugated: 0.020 inch thick.

END OF SECTION 220700

SECTION 221116
DOMESTIC WATER PIPING

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 SUMMARY

A. This Section includes domestic water piping inside the building.

B. Related Sections include the following:
1. Division 2 Section "Water Distribution" for water-service piping outside the building from source to the point where water-service piping enters the building.
2. Division 23 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
3. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Water Samples: Specified in Part 3 "Cleaning" Article.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
   1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
   3. 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.
   4. Manufacturers:
      a. Cambridge Lee
      b. Howell Metal
      c. Cerro Flow Products

B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
   1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
   3. 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.
   4. Manufacturers:
      a. Cambridge Lee
      b. Howell Metal
      c. Cerro Flow Products

C. Wrought Copper and Copper Alloy Solder Joint Pressure Fittings:
   1. Copper Pressure Fittings: ASME/ANSI standard B16.18 cast copper-alloy or ASME B16.22, wrought-copper solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Wrought-copper fittings must be NSF/ANSI 61 registered.
      a. Cello Products
      b. Elkhardt Products
      c. Mueller Industries

2.3 VALVES

A. Bronze and cast-iron, general-duty valves are specified in Division 22 Section "General-Duty Valves for Plumbing."

B. Balancing and drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Perform all excavation and backfilling for work included in Division 22 of the specifications.

3.2 EXCAVATION

A. Excavations shall be performed in strict accordance with latest OSHA regulations. Sheeting, bracing, barricades and fencing shall be installed wherever necessary to avoid undue hazards to workmen or passersby.

B. During excavation, material shall be piled at a distance from the banks of the excavation that will avoid overloading and will prevent slides and/or cave-ins. Water accumulating in excavations shall be removed by pumping. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled under sidewalks and curbs where pipe can be installed as specified and back-fill can be tamped. All trenches and pit excavations shall be shored and/or braced as required to prevent slides and/or cave-ins.

C. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the making of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. Over-depths shall be backfilled as specified and with materials for backfilling as specified.

3.3 BACKFILLING

A. The trenches shall not be backfilled until all required pressure and/or leak tests on piping are performed and until the mechanical systems as installed conform to requirements specified in the several sections covering the installation of the various systems. Trenches shall be backfilled to the ground surface with clean, selected excavated material or other material that meets compaction requirements and as hereinafter specified. Pavement and base course disturbed by trenching operation shall be restored to its original condition.

B. Backfill material shall be deposited in 6-inch thick layers and compacted with mechanical tamps to the density of the adjacent soil or grade until there is a cover of not less than 2 feet

over pipes. The backfill material in this portion of the trench shall consist of earth, sandy clay, soft shale, or other materials free from objects larger than 1 inch in any direction.

C. The remainder of the trench shall be backfilled with clean, select material that is free of stones larger than 3 inches in any direction. Backfill material shall be deposited in layers not exceeding 6 inches thick, and each layer shall be compacted mechanically. Settling of granular, noncohesive material with water will be permitted. The surface shall be mounded over for settling and left in a uniform condition.

3.4 COMPACTION AND TESTING

A. Areas under building locations, paving, walks or other structures which may be placed on site at a future date shall be compacted to 95% minimum dry proctor.

3.5 PIPE AND FITTING APPLICATIONS

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 may be used on aboveground piping, unless otherwise indicated.

C. Under-Building-Slab, Water-Service Piping on Service Side of Water Meter: Refer to Division 2 Section "Water Distribution."

D. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 3/4" and Smaller: Soft copper tube, Type K; copper pressure fittings; no joints below slab.

E. Aboveground Domestic Water Piping: Use the following piping materials:
   1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.

F. Non-Potable-Water Piping: Use the following piping materials for each size range:
   1. 1-1/2 and Smaller: Soft copper tube, Type K; copper pressure fittings; and soldered joints. No joints below slab.

3.6 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use bronze ball valves for piping 3" and smaller.
   2. Throttling Duty: Use full port bronze ball valves for piping 2" and smaller.
   3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
   4. Drain Duty: Hose-end drain valves.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use full port ball valves for piping 3" and smaller.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.
   2. Install stop-and-waste drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping 2" and smaller. Balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

3.7 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing".

B. Install under-building-slab copper tubing 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. Pressure gages are specified in Division 22 Section "Meters and Gages," and drain valves and strainers are specified in Division 22 Section "Domestic Water Piping Specialties."

D. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 22 Section "Domestic Water Piping Specialties."

E. Install domestic water piping level and plumb.

3.8 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Soldered Joints: Use ASTM B 813, water-soluble, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.9 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.

E. 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 1-1/2: 72 inches with 3/8-inch rod.
   3. NPS 2 thru NPS 3: 96 inches with 1/2-inch rod.
   4. NPS 4 thru NPS 6: 96 inches with 5/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow 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, and extend and connect to the following:
   1. Water Heaters: Cold-water supply 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 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.

3.11 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:
   1. Do not enclose, cover, or put piping into operation until it has been inspected, tested and approved by authorities having jurisdiction (AHJ), the Owner, and the Building inspections department.
   2. Notification of Inspections shall include the Architect, Engineer, Building Inspections Department (AHJ) and the Owner. A notification of at least 48 hours shall be given before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction. All reports shall be submitted to the Architect with any required corrective action listed once test is completed.

B. Test domestic water piping as follows:
1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. 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.
3. 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.
4. 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 to stand for four (4) hours. Leaks and loss in test pressure constitute defects that must be repaired.
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.

3.12 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
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 flow of hot water in each branch.
b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.13 CLEANING

A. Contractor shall provide signage at all potable water outlets where systems or portions of systems are being tested with date and duration of test(s) prior to commencement of disinfection procedure. Notification of system cleaning shall be sent to the Architect’s office 24 hours prior to actual performance of work. A copy of the biological examination of the test results shall be sent to the Architect’s office for review and approval.

B. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as 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 chlorine. Isolate with valves and allow to stand for 24 hours. Open and close all valves in system several times during the retention period.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time. Open and close all valves in the system several times during the flushing period.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

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 SUMMARY

A. This Section includes the following domestic water piping specialties:
   1. Vacuum breakers.
   2. Backflow preventers.
   3. Balancing valves.
   4. Strainers.
   5. Hose bibbs.
   6. Wall hydrants.
   7. Drain valves.
   8. Water hammer arresters.
   9. Trap-seal primer valves.
   10. Individual fixture water tempering valves.
   11. Thermostatic water mixing valve.
   12. Roof hydrants.

B. Related Sections include the following:
   1. Division 22 Section "Meters and Gages" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For domestic water piping specialties 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. NSF Compliance:
1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cash Acme.
   b. Conbraco Industries, Inc.
   c. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1001.
3. Size: As required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded or sweat.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cash Acme.
   b. Conbraco Industries, Inc.
   c. Woodford Manufacturing Company.
2. Vacuum breakers shall be provided on all outlets threaded for hose ends. Vacuum breakers shall be the screw on vandal proof type with hose outlet threads.

2.2 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ITT Industries; Bell & Gossett Div.
   b. NIBCO INC.
   c. Cash/Acme

2. Type: Ball valve with two readout ports and memory setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.

2.3 INDIVIDUAL FIXTURE, WATER TEMPERING VALVES

A. Individual-Fixture, Water Tempering Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lawler Manufacturing Company, Inc. – 911E/F
   b. Leonard Valve Company. – TA-300
   c. Powers; a Watts Industries Co. – ES 150
2. Standard: ASSE 1071 and ANSI Z358.1, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: 60-95 degree range adjustable with internal cold water bypass.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 85 deg F.

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.5 HOSE BIBBS

A. Hose Bibbs (HB):
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Mechanical Closets or Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: NA – finished rooms shall be provide with WH

11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.6 WALL HYDRANTS

A. Exterior Non-freeze Wall Hydrants (NFWH):
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Woodford Manufacturing Company
   e. Watts Industries
   f. Wade Industries
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

B. Interior Wall Hydrants (WH):
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Woodford Manufacturing Company.
   e. Watts Industries
   f. Wade industries
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants, less non-freeze features.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

7. Box: Deep, flush mounting with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER HAMMER ARRESTERS

A. Water Hammer Arresters (WHA or SA):
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. MIFAB, Inc.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.
   d. Watts Industries
   e. PPP Inc. series SBHA- 500
2. Standard: PDI-WH 201.
3. Type: Metal bellows.
4. Size: PDI-WH 201, Sizes A through F.

2.9 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. MIFAB, Inc.
   b. PPP Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.

5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
8. See plans for application and locations.

2.10 THERMOSTATIC WATER MIXING VALVES (TV)

A. Water-Temperature Limiting Devices:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Conbraco Industries, Inc.
   b. Leonard Valve Company.
   c. Powers; a Watts Industries Co.
   d. Symmons Industries, Inc.
   e. Lawler Mfg. Co.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 110 deg F.
9. Tempered-Water Design Flow Rate: As shown on plans.
10. Valve Finish: Rough bronze
11. Unit shall be factory tested.
12. Install per manufacturers' recommendations.
13. Install thermometer, if not part of unit, on tempered water discharge line.

2.11 ROOF HYDRANTS

A. Non-freeze, Automatic Draining Roof Hydrants with Roof Mounting System
1. Standard: ASSE 1052
2. Manufacturers:
   a. Woodford Model RHY2-MS
   b. Zurn
   c. Watts
3. Operation: Lever piston operating mechanism with drain port designed to discharge into the drainage system automatically via 1/8” NPT thus not requiring a flushing maintenance procedure.
4. Roof attachment: Separate mounting system consisting of cast iron basin to be installed by the roofing contractor.
5. Length: Valve body inlet to be located in heated area.
6. Inlet: 1” NPT
7. Outlet: Dual check vacuum breaker compliant with ASSE 1052
   a. Garden-hose thread complying with ASME B1.20.7 on outlet.

8. Venturi style drain free roof hydrants not recommended.

B. Install on roof in pre-manufactured pipe curb assembly flashed to roof with weather proof penetration. Unit shall be secured to roof deck.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, solenoid valve.

E. Install water hammer arresters in water piping according to PDI-WH 201 and accessible above ceilings. Install access panels where required in hard ceilings.

F. 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. Valve shall be installed above accessible ceilings.

G. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding."

C. Connect wiring according to Division 26 Section "Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Calibrated balancing valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section " Identification for Plumbing Piping and Equipment."

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature limit stops on faucets.

END OF SECTION 221119

SECTION 221316
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, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:
   1. Pipe, tube, and fittings.

B. PERFORMANCE REQUIREMENTS

C. 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.

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:
   1. Include plans, elevations, sections, and details.

C. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, below floor for sanitary waste and vent, and kitchen waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

D. Manufacturers:
1. Charlotte Pipe
2. Tyler Pipe
3. AB&I

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, below floor for sanitary waste and vent, and kitchen waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast iron Soil Pipe Institute (CISPI) and be listed by NSF.
1. Manufacturers:
   a. Charlotte Pipe
   b. Tyler Pipe
   c. AB&I

B. Shielded Couplings: ASTM 1540 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
   a. Manufacturers:
      1) Clamp-All Corp. - Model 80
      2) Ideal Div.; Stant Corp. – Heavy Weight
      3) Husky – SD-2000
      4) Tyler Pipe; Soil Pipe Div.

2.5 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
a. Manufacturers:
b. 1) Cambridge Lee
c. 2) Howell Metal
d. 3) Cerro Flow Products

2.6 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, below floor for sanitary waste and vent.
1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.
a. Manufacturers:
1) Charlotte Pipe & Foundry Co.
2) Sanderson
3) Lasco
4) Tigre

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Perform all excavation and backfilling for work included in Division 22 of the specifications.

3.2 EXCAVATION

A. Excavations shall be performed in strict accordance with latest OSHA regulations. Sheeting, bracing, barricades and fencing shall be installed wherever necessary to avoid undue hazards to workmen or passersby.

B. During excavation, material shall be piled at a distance from the banks of the excavation that will avoid overloading and will prevent slides and/or cave-ins. Water accumulating in excavations shall be removed by pumping. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled under sidewalks and curbs where pipe can be installed as specified and back-fill can be tamped. All trenches and pit excavations shall be shored and/or braced as required to prevent slides and/or cave-ins.

C. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the making of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been

graded. Over-depths shall be backfilled as specified and with materials for backfilling as specified.

3.3 BACKFILLING

A. The trenches shall not be backfilled until all required pressure and/or leak tests on piping are performed and until the mechanical systems as installed conform to requirements specified in the several sections covering the installation of the various systems. Trenches shall be backfilled to the ground surface with clean, selected excavated material or other material that meets compaction requirements and as hereinafter specified. Pavement and base course disturbed by trenching operation shall be restored to its original condition.

B. Backfill material shall be deposited in 6-inch thick layers and compacted with mechanical tamps to the density of the adjacent soil or grade until there is a cover of not less than 2 feet over pipes. The backfill material in this portion of the trench shall consist of earth, sandy clay, soft shale, or other materials free from objects larger than 1 inch in any direction.

C. The remainder of the trench shall be backfilled with clean, select material that is free of stones larger than 3 inches in any direction. Backfill material shall be deposited in layers not exceeding 6 inches thick, and each layer shall be compacted mechanically. Settling of granular, noncohesive material with water will be permitted. The surface shall be mounded over for settling and left in a uniform condition.

3.4 COMPACTION AND TESTING

A. Areas under building locations, paving, walks or other structures which may be placed on site at a future date shall be compacted to 95% minimum dry proctor.

3.5 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Above ground, soil and waste and kitchen waste piping 10" and smaller shall be the following:
   1. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
   2. Copper DWV tube, copper drainage fittings, and soldered joints.

C. Above ground, sanitary vent and kitchen vent piping 6" and smaller shall be the following:
   1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.

D. Underground, soil, waste, and vent piping 15" and smaller shall be the following:
   1. Schedule 40, solid wall, PVC piping, solvent socket weld DWV fittings.

E. Underground, kitchen waste, and vent piping 15" and smaller shall be the following:

1. Service weight, cast-iron soil piping; hub and spigot, compression gaskets or lead and oakum joints.

3.6 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."

B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing".

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. 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."

E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. 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. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. 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.

F. Lay buried building 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.

G. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Building Sanitary Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller or 2 percent where called for on plans; 1 percent downward in direction of flow for piping NPS 4 and larger.
   2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow or 2 percent where called for on plans.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

J. Hub and spigot piping connections shall not be used above slab on grade.

K. Install PVC sanitary drainage piping according to ASTM D 2665.

L. Install underground PVC sanitary drainage piping according to ASTM D 2321.

3.7 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

D. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

E. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

F. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.8 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

3.9 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:
   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. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. 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: 60 inches with 3/4-inch rod.
   5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/4: 72 inches with 3/8-inch rod.
   2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
   3. NPS 2-1/2: 108 inches with 1/2-inch rod.
   4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
   5. NPS 6: 10 feet with 5/8-inch rod.
   6. NPS 8: 10 feet with 3/4-inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect drainage and vent piping to the following:
   1. Plumbing Fixtures: Connect drainage 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 drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
   4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.11 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. Water test sanitary drainage 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. 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 drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, 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 to completion of inspection, water level must not drop. 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. 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. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. 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.

E. Video camera testing shall be performed on under floor sanitary waste systems, and kitchen waste system to the sanitary sewer manhole connection. Refer to section 227000 “Plumbing Systems Testing” requirements, procedures and reporting.

3.12 UNDERGROUND PIPING IDENTIFICATION

A. All PVC underground sanitary waste and vent piping where allowed or identified on plans installed outside the building pad shall have continuous warning identification tape installed 12” above the top of the pipe and a minimum of 6” below finished grade.

B. All exterior underground PVC piping shall have a continuous tracer wire installed on the top of the pipe and attached with cable ties on 6’ centers maximum spacing and within 12” from tees, branch connections and manufactured elbows.

3.13 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.

END OF SECTION 221316

SECTION 221319

DRAINAGE PIPING SPECIALTIES

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 SUMMARY

A. This Section includes the following drainage piping specialties:
1. Cleanouts.
2. Floor drains.
3. Roof Drains.
4. Downspout Nozzles.
5. Roof flashing assemblies.
6. Trap Guard Inserts

1.3 DEFINITIONS

A. PE: Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate size and location of roof penetrations.

C. Coordinate locations of wall cleanouts so as not to be located behind casework or cabinets.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Cleanouts shall be provided where shown on the drawings, and as required by the applicable plumbing code. All wall and floor cleanouts shall have access cover and cleanout plugs removed at time of final project review.

B. Cleanouts on under floor drainage piping shall have piping extended to the floor and finished with cleanout plug and removable floor plate.

C. Cleanouts installed in carpeted areas shall have carpet marker and securing screw.

D. Cleanouts in waterproofed floors or overhead slabs shall have flashing clamps.

E. Cleanouts in vertical piping shall be roughed with centerline not more than 1'-6" above the finished floor, but high enough for escutcheon cover to clear the baseboard.

F. For Walls: Cleanouts shall be no-hub cleanout tee with bronze countersunk plug tapped for machine screw with shallow stainless-steel face-of wall access cover.

1.	Jay R. Smith	4510-Y
2.	Josam	58790
3.	Wade	8560E
4.	Zurn	Z-1446-BP
5.	Watts Drainage	CO 460 RD

G. For Concrete Floors: Cleanouts shall have cast iron body, adjustable round scoriated nickel bronze cover and rim and countersunk taper threaded bronze plug.

1.	Jay R. Smith	4028C-U-PB
2.	Josam	56000-15-22
3.	Wade	W-6010-75
4.	Zurn	Z-1405-2
5.	Watts Drainage	CO 200 R

H. Yard Cleanouts: Cleanouts shall have tractor weight cast iron housing and countersunk bronze plug. Cleanouts shall be set in a 16" X 16" X 6" deep poured concrete pad set flush with grade.

1.	Jay R. Smith	4243-U
2.	Josam	56050-22
3.	Wade	7030-2
4.	Zurn	Z1450-1
5.	Watts Drainage	CO 200 RX-4-34B

I. A cleanout plug and cleanout cover removal tool for each type cleanout plug and cleanout cover shall be installed on wall of main mechanical room at close-out of project for use by maintenance personnel. Cleanout tools shall be turned over to the Architect and signed for prior to substantial completion.

J. Immediately prior to Owner's final review, all wall and floor cleanout plugs shall be removed from cleanouts on the final project review to assure the Owner that cleanout plugs can be removed without any obstructions. Apply anti-seize lubricant to all threads of cleanout plugs and replace cleanout plugs and access covers immediately following Owner's final review.
1. Acceptable manufacturers of anti-seize lubricants:
   a. Fel-Pro C5-A
   b. Rectorseal Break-out
   c. Lub-O-Seal Never-seez

2.2 FLOOR DRAINS

A. FD-1:
1. Floor drains shall have a cast iron body and flashing flange with adjustable 6" round nickel bronze strainer, sediment bucket, Philips head stainless steel securing screws, and trap primer connection.
2. Drains shall be: Jay R. Smith 2010-A-B-P050 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

B. FD-2:
1. Floor drain shall have coated cast iron body and flashing flange, 7" round nickel bronze strainer with anti splash collar.
2. Drains shall be: Jay R. Smith 2010-A-F-37 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

C. FS-1: (Floor Sink):
1. Drain shall be cast iron body, acid resistant coated with 8-1/2" square nickel bronze top, stainless steel securing screws, dome bottom strainer, minimum 6" deep with 3" outlet.
2. Drains shall be: Jay R. Smith 3100-13 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.
3. Provide top grate/cover options as called for on plans.

D. FFD: (Funnel Floor Drain):
1. Drain shall have a cast iron body and cast-iron flashing flange with adjustable 6" round nickel bronze strainer with stainless steel securing screws, and funnel attached to grate top.
2. Drain shall be: Jay R. Smith 2010-A/Fig. 3580-NB or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

2.3 ROOF DRAINS

A. Metal Primary Roof Drains (RD):
1. Basis-of-Design Product: Jay R. Smith 1015-C-R-CID or a comparable product by one of the following:
   a. Josam Company; Josam Div.
   b. Zurn Plumbing Products Group; Specification Drainage Operation
   c. Watts Drainage
2. Standard: ASME A112-21.2M

3. Pattern: Roof drain.
4. Body Material: Cast iron
5. Dimensions of Body: Nominal 15" drain
6. Combination Flashing Ring and Gravel Stop: Required
7. Flow-Control Weirs: Not required
8. Outlet: Bottom
9. Dome Material: Cast iron
10. Extension Collars: Required
11. Underdeck Clamp: Required
12. Sump Receiver: Required

B. Metal Overflow Roof Drains (OFD)
1. Basis-of-Design Product: Jay R. Smith 1070-C-R-CID-CIS or a comparable product by one of the following:
   a. Josam Company; Josam Div.
   b. Zurn Plumbing Products Group; Specification Drainage Operation
   c. Watts Drainage
2. Standard: ASME A112.21.2N
3. Pattern: Roof drain.
4. Body Material: Cast iron
5. Dimensions of Body: Nominal 15" drain
6. Combination Flashing Ring and Gravel Stop: Required
7. Water Dam: 3" high
8. Outlet: Bottom
9. Dome Material: Cast iron
10. Extension Collars: Required
11. Underdeck Clamp: Required
12. Sump Receiver: Required

2.4 DOWNSPOUT NOZZLES

A. Overflow roof drain piping shall terminate thru exterior wall high in a downspout nozzle sized as shown on plans. Locate in plan and elevation as indicated on Architectural drawings. Nozzle shall be a cast bronze body, hinged perforated cover, and wall flange for mounting on exterior wall at minimum 3 places. Cast iron overflow drain piping shall be threaded to screw into nozzle.

B. Manufacturers: Basis of Design Jay R. Smith 1775, or equal by Zurn, Josam, or Wade.

2.5 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Acorn Engineering Company; Elmdor/Stoneman Div.
   b. Thaler Metal Industries Ltd.
   c. Marathon Roofing Products.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 10 inches from pipe, with galvanized-steel boot reinforcement and counter flashing fitting.
   1. Open-Top Vent Cap: Without cap.
   2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
   3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.6 TRAP GUARD INSERTS

A. Trap guard inserts shall be installed in all floor drains and hub drains that require trap primers by Code to provide a water-tight seal and prevent emission of sewer gases. Product shall meet or exceed all testing requirements for the ASSE 1072 Standard approval process. Unit shall meet or exceed flow rates listed IPC 709.1 for drain size used and as listed in the standard.

B. Manufacturers:

   1. Jay R. Smith: 2692 Quad Close Trap Seal
   2. ProSet Systems: TG Series Trap Guard
   3. Josam: TSI Waterless Trap Seal
   4. RectorSeal: SureSeal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. 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.
   3. Locate at minimum intervals of 50 feet for piping NPS 3 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.
   5. Cleanouts shall not be located behind casework or cabinets.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall. Install high enough for escutcheon cover to clear baseboard.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
   3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install deep-seal traps on all mechanical room floor drains and other waste outlets, where indicated on plans, or as required by Code.

H. 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.

I. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

J. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

K. Install trap primer lines below slab on grade to pitch to drains. No joints shall be installed in trap primer lines below slab on grade. Trap primer lines below grade shall be wrapped and coated.

L. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 7.
   1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
   2. Position roof drains for easy access and maintenance.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

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 221319

SECTION 221413

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. This Section includes the following storm drainage piping inside the building:
   1. Pipe, tube, and fittings.

B. Related Sections include the following:
   1. Division 22 Section "Drainage Piping Specialties."

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

B. TPE: Thermoplastic elastomer.

1.4 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 above the highest connection point in the system.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, below floor for sanitary waste and vent, and kitchen waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

D. Manufacturers:
   1. Charlotte Pipe
   2. Tyler Pipe
   3. AB&I

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, below floor for sanitary waste and vent, and kitchen waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF.
   1. Manufacturers:
      a. Charlotte Pipe
      b. Tyler Pipe
      c. AB&I

B. Shielded Couplings: ASTM 1540 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
   1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
      a. Manufacturers:
         1) Clamp-All Corp. - Model 80
         2) Husky – SD-2000
         3) Tyler Pipe; Soil Pipe Div.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.5 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
   1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.
      a. Manufacturers:
         1) Charlotte Pipe & Foundry Co.
         2) Sanderson
         3) Lasco
         4) Tigre

B. Where piping is installed below grade outside of building pad, install continuous #12 bare copper wire on top of pipe along entire length affixed to pipe with plastic tie straps a maximum of 4’ on center from building to manhole.

C. Install continuous buried warning identification tape 12” above top of pipe in trench from building manhole.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Excavations shall be performed in strict accordance with latest OSHA regulations. Sheeting, bracing, barricades and fencing shall be installed wherever necessary to avoid undue hazards to workmen or passersby.

B. During excavation, material shall be piled at a distance from the banks of the excavation that will avoid overloading and will prevent slides and/or cave-ins. Water accumulating in excavations shall be removed by pumping. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled under sidewalks and curbs where pipe can be installed as specified and back-fill can be tamped. All trenches and pit excavations shall be shored and/or braced as required to prevent slides and/or cave-ins.

C. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the making of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. Over-depths shall be backfilled as specified and with materials for backfilling as specified.

3.2 BACKFILLING

A. The trenches shall not be backfilled until all required pressure and/or leak tests on piping are performed and until the mechanical systems as installed conform to requirements specified in the several sections covering the installation of the various systems. Trenches shall be backfilled to the ground surface with clean, selected excavated material or other material that

meets compaction requirements and as hereinafter specified. Pavement and base course disturbed by trenching operation shall be restored to its original condition.

B. Backfill material shall be deposited in 6-inch thick layers and compacted with mechanical tamps to the density of the adjacent soil or grade until there is a cover of not less than 2 feet over pipes. The backfill material in this portion of the trench shall consist of earth, sandy clay, soft shale, or other materials free from objects larger than 1 inch in any direction.

C. The remainder of the trench shall be backfilled with clean, select material that is free of stones larger than 3 inches in any direction. Backfill material shall be deposited in layers not exceeding 6 inches thick, and each layer shall be compacted mechanically. Settling of granular, non-cohesive material with water will be permitted. The surface shall be mounded over for settling and left in a uniform condition.

3.3 COMPACTION AND TESTING

A. Areas under building locations, paving, walks or other structures which may be placed on site at a future date shall be compacted to 95% minimum dry proctor.

3.4 PIPING APPLICATIONS

A. Aboveground storm drainage piping 10" and smaller shall be the following:
1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings and coupled joints.

B. Underground storm drainage piping below building pad 15" and smaller shall be one of the following:
1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints (8" and smaller).
2. Solid wall PVC pipe and fittings with gasketed joints (10" and larger).

C. Underground, storm drainage piping outside of building pad 15" and smaller shall be the following:
1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints (8" and smaller).
2. Solid wall PVC pipe and fittings with gasketed joints (10" and larger).

3.5 PIPING INSTALLATION

A. Storm sewer and drainage piping outside the building are specified in Division 33 Section "Storm Drainage."

B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Drainage Piping Specialties."

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to

make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

E. 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."

F. 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.

G. 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.

H. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
   1. Building Storm Drain: 2 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.

I. Install engineered controlled-flow storm drainage piping in locations indicated.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install PVC storm drainage piping according to ASTM D 2665.

L. Install underground PVC storm drainage piping according to ASTM D 2321.

M. Do not enclose, cover, or put piping into operation until it is tested, inspected and approved by authorities having jurisdiction.

N. Cast iron downspout boots a minimum of 18" high to be installed for all exterior aluminum downspouts piped to storm water systems below grade; install a minimum 4" yard cleanout within 3' of each boot at grade in a minimum 12" square by 4" deep concrete pad

3.6 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

D. PVC Non pressure Piping Joints: Join piping according to ASTM D 2665.

3.7 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:
      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. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. 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: 60 inches with 3/4-inch rod.
   5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.
   6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for 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: 48 inches with 3/4-inch rod.
   5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

H. Install supports for vertical piping every 48 inches.

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.8 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.

3.9 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 testing has been completed.
   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, except outside leaders, 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 to 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.

3.10 PIPING IDENTIFICATION

A. All above ground downspout/rainwater piping shall be identified with pipe identification labels as specified in Division 22 Section “Identification for Plumbing Piping and Equipment".

B. All underground PVC storm/downspout piping installed outside the building pad shall have continuous warning identification tape installed 12” above the top of the pipe and a minimum of 6” below finished grade.

C. All underground PVC piping shall have a continuous tracer wire installed on the top of the pipe and attached with cable ties on 6’ centers maximum spacing and within 12” from tees, branch connections and manufactured elbows.

3.11 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.

END OF SECTION 221413

SECTION 223300

ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section includes the following electric water heaters:
   1. Commercial, storage electric water heaters.
   2. Water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Product Certificates: For each type of commercial electric water heater, signed by product manufacturer.

C. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

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 NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.4 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within

specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty operation of controls.
   b. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period(s): From date of Final Completion:
   a. Commercial Electric Water Heaters:
      1) Storage Tank: Three years.
      2) Controls and Other Components: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 COMMERCIAL ELECTRIC WATER HEATERS

A. Commercial, Storage Electric Water Heaters: Comply with UL 1453 requirements for storage-tank-type water heaters.
   1. Manufacturers:
      a. Bradford White Corporation.
      b. Smith, A. O. Water Products Company.
      c. Rheem.
   2. Storage-Tank Construction: Non-ASME-code, steel vertical arrangement.
      a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
         1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
         2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
   3. Factory-Installed Storage-Tank Appurtenances:
      a. Anode Rod: Replaceable magnesium.
      b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
      c. Insulation: Comply with ASHRAE/IESNA 90.1.
      d. Jacket: Steel with enameled finish.
      e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
         1) Staging: Input not exceeding 60 kW per step.
      f. Temperature Control: Adjustable thermostat.
      g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
      h. Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3, for combination temperature and pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include

pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank. Relief valves shall be shipped with the heater from the factory.

4. Special Requirements: NSF 5 construction.
5. Capacity and characteristics for water heaters are scheduled on the plans.

2.3 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: Factory supplied, ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than water heater working-pressure rating.

C. Drain Pans: Corrosion-resistant metal with 2” high minimum raised edge. Include dimensions not less than base of water heater plus 4” and include drain outlet not less than NPS 3/4.

2.4 SOURCE QUALITY CONTROL

A. Hydrostatically test commercial water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

B. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on level surfaces or on 4” high concrete pads as indicated on the plans.
   1. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing”.

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls, nameplate, and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap into floor drain or service sink.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains, mop receptors, or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water piping Specialties" for hose-end drain valves.

E. Install thermometer on hot water outlet piping of water heaters.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low Voltage Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 22 33 00

SECTION 223800

SUMP PUMPS

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 submersible sump pumps and accessories, inside the building for connection to building sanitary drainage systems.

1.3 SUBMITTALS

A. Product Data: For each type and size of sump pump specified. Include certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

1.4 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Subject to compliance with requirements, provide a product by one of the manufacturers specified.

2.2 SUBMERSIBLE SUMP PUMPS

A. Manufacturers:
   1. Zoeller
   2. Bell & Gossett Domestic Pump; ITT Industries.
   3. Grundfos Pumps Corp.
   4. Liberty Pumps.
   5. Weil Pump Company, Inc.
   6. Meyers

B. Description: Factory-assembled and -tested, simplex, single-stage, centrifugal, end-suction, submersible, direct-connected sump pumps complying with UL 778 and HI 1.1-1.2 and HI 1.3 for submersible sump pumps.

C. Casing: Cast iron; with legs that elevate pump to permit flow into volute, and vertical discharge with 1-1/2" threaded NPT for piping connection.

D. Impeller: Statically and dynamically balanced, vortex or semi-open, non-clog design, overhung, single suction, keyed and secured to shaft.

E. Motor: Hermetically sealed, 120 V, capacitor-start type, with built-in overload protection; three-conductor waterproof power cable of length required, and with grounding plug and cable-sealing assembly for connection at pump. Comply with requirements in Division 23 Section "Motors."

F. Pump Discharge Piping: Factory or field fabricated, copper tube.

G. Controls: SEE Water OSS20PBPR pump switch with piggyback plug.

H. Performance: Pump must be able to generate 50 gpm flow at 20' TDH.

2.3 OIL SMART MONITORING SYSTEM

A. General

1. These specifications describe model OSS-100 as manufactured by See Water, Inc., San Jacinto, California, or approved equal. The contractor shall furnish and install the Oil Smart OSS-100 as specified herein.

2. The OSS-100 includes the Oil Smart Pump Switch, Model #OSS20PBPR6 and Oil Smart Alarm System, Model #OSA-05.

3. The Oil Smart Pump Switch, Model #OSS20PBPR6 and Oil Smart Alarm System, Model #OSA-05 shall each plug into a Single Phase, 60Hz. 120VAC common receptacle.

4. The Oil Smart Pump Switch shall not allow pumping if oil is detected.

5. The Oil Smart Alarm System shall alert of a high liquid presence and differentiate between water and oil.

B. Certification

1. The system shall be built by a UL 508A approved control systems manufacturer (See Water, Inc. or approved equal) and 100% tested at the factory prior to shipping. Additionally, the panel shall be certified by a second certification company (CSA International or approved equal).

C. Warranty

1. The Oil Smart System OSS-100 shall be warranted in writing against defects in materials and workmanship under normal use and service for a period of three (3) years from the date of shipment when installed and used in accordance with the manufacturer recommendations.

D. Construction

1. The enclosure shall be a wall-mount style type 3R. The control panel shall be UL listed and CSA approved. The control panel shall feature visible high liquid level alarm red beacon light, high water level white light, and high oil level yellow light. A high liquid level condition shall activate the 85-decibel alarm. The front panel shall include alarm test and silence buttons.

2. The panel shall be equipped with remote monitoring dry contacts including high liquid, high oil and high-water present conditions. Alarm shall be tied into the building EMS.

3. The pump controller shall be UL listed as an across the line starter type pump switch and rated for the pump's full load amps.

4. The system shall incorporate an Oil Smart Pump Switch and Liquid Smart Alarm Sensor. The Oil Smart Pump Switch shall include "on" and "off" sensors providing a specific water pumping range and shall not pump oil. The Liquid Smart Alarm Sensor shall detect a high liquid level condition and differentiate between oil and water. The controls shall both be able to differentiate between oil and water and consist of no moving parts. The alarm component shall be separate from the pump control component to prevent nuisance alarms and so alarm component can be placed at the actual high liquid level. An alarm component connected to the pump control shall not be acceptable.

5. Control system shall be an Oil Smart, OSS-100 or approved equal.

PART 3 - EXECUTION

3.1 SUMP PUMP INSTALLATION

A. Install sump pumps according to applicable requirements in HI 1.4.

B. Install pumps and arrange to provide access for maintenance including removal of motors, impellers, couplings, and accessories.

C. Set submersible sump pumps on pit floor. Make direct connections to sanitary drainage piping.

D. Support piping so weight of piping is not supported by pumps.

E. Piping installation requirements are specified in Division 22 Section "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

F. Install piping adjacent to sump pumps to allow service and maintenance.

G. Connect sanitary drainage piping to pumps. Install discharge piping equal to or greater than size of pump discharge piping. Refer to Division 22 section "Sanitary Waste and Vent Piping."
   1. Install check and shutoff valves on discharge piping from pump. Install union on pumps having threaded pipe connections. Install valves same size as connected piping. Refer to Division 22 Section "General-duty Valves for Plumbing Piping" for general-duty valves for drainage piping.

H. Ground equipment according to Division 26 Section "Grounding and Bonding."

I. Connect wiring according to Division 26 Section "Conductors and Cables."

END OF SECTION 223800

SECTION 224000

PLUMBING FIXTURES

PART 1 – GENERAL

1.1 APPLICABILITY

A. All work specified in this Section is subject to the provisions of Section 22 05 00.

1.2 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components. Refer to “Plumbing Fixture Schedule” found at the end of this section for basis of design fixtures and model numbers.
   1. Lavatory Faucets
   2. Flushometers.
   3. Toilet seats.
   4. Protective shielding guards.
   5. Fixture supports.
   6. Water closets.
   7. Wall-hung Lavatories
   8. Urinals.
   9. Mop receptor basins.
   10. Mop receptor Faucets
   11. Countertop sink faucets.
   12. Drop-in stainless-steel sinks
   13. Dishwasher Air-gap fittings

B. Related Sections include the following:
   1. Division 10 Section "Toilet and Bath Accessories."
   2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers and specialty fixtures not included in this Section.
   3. Division 22 Section "Drainage Piping Specialties" for floor drains, cleanouts, and other indirect waste specialties.

1.3 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
   1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in the 2010 ADA Standards for Accessible Design for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
   1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
   2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
   3. Stainless-Steel Residential Sinks: ASME A112.19.3.
   4. Vitreous-China Fixtures: ASME A112.19.2M.

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
   1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
   2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
   3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
   4. Faucets: ASME A112.18.1.
   5. Hose-Connection Vacuum Breakers: ASSE 1011.
   6. Hose-Coupling Threads: ASME B1.20.7.
   7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
   8. NSF Potable-Water Materials: NSF 61.
   9. Pipe Threads: ASME B1.20.1.
   10. Supply Fittings: ASME A112.18.1.
   11. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for shower faucets:
   1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
   2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
   3. Deck-Mounted Bath/Shower Transfer Valves: ASME 18.7.
   4. Faucets: ASME A112.18.1.
   5. Hand-Held Showers: ASSE 1014.
   6. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
   7. Hose-Coupling Threads: ASME B1.20.7.
   8. Manual-Control Antiscald Faucets: ASTM F 444.
   9. Pipe Threads: ASME B1.20.1.
   10. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
   1. Atmospheric Vacuum Breakers: ASSE 1001.
   2. Brass and Copper Supplies: ASME A112.18.1.
   3. Manual-Operation Flushometers: ASSE 1037.
   4. Plastic Tubular Fittings: ASTM F 409.
   5. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Flexible Water Connectors: ASME A112.18.6.
   2. Floor Drains: ASME A112.6.3.
   3. Grab Bars: ASTM F 446.
   4. Hose-Coupling Threads: ASME B1.20.7.
   5. Off-Floor Fixture Supports: ASME A112.6.1M.
   6. Pipe Threads: ASME B1.20.1.
   7. Plastic Toilet Seats: ANSI Z124.5.
   8. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

A. All fixtures and accessories shall be warranted against defects in materials and workmanship for a period of one year from date of acceptance by the Owner.

PART 2 – PRODUCTS

2.1 LAVATORY FAUCETS

A. Countertop Lavatory Faucets: P301H, P302H, P303H:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Chicago Etronic 80 Series (Basis of design)
      b. Moen Commercial

c. Sloan
d. Symmons
e. Zurn
f. American Standard

2. Deck mount single hole, ADA compliant, battery powered sensored faucet, vandal proof pressure compensating laminar flow outlet 0.5 GPM.
3. Faucet shall have an unconditional warranty of 5 years. Warranty letter shall accompany product submittals.
5. Where only hot is provided, connect CW to both inlets.

2.2 FLUSHOMETERS

A. Flushometers, P106, P106H, P203, P203H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Sloan Valve Company.
b. Zurn Plumbing Products Group; Commercial Brass Operation.
c. TOTO
2. Description: Battery powered sensored flushometer for water-closet-type fixtures. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, polished chrome-plated finish on exposed parts and solid ring pipe support to wall for water closets. Provide ADA handle on accessible fixtures.
3. Provide solid ring supports on water closet flush valves. Solid ring supports are not required on urinal flush valves.
4. Basis of design – water closet flush valve; Sloan G2 811
5. Basis of design – urinal flush valve; Sloan G2 8186
6. Flush valves for water closets shall be 1.28 gpf.
7. Flush valves for urinals shall be 0.5 gpf.
8. Coordinate installation of flushometer rough-in with grab bars in handicap stalls.

2.3 TOILET SEATS

A. Toilet Seats, P106, P106H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Bemis Manufacturing Company. 1955SSCT
b. Church Seats.295SSCT
c. Olsonite Corp.10SSCT
2. Description: Toilet seat for water-closet-type fixture.
a. Material: Molded, solid plastic.
b. Configuration: Open front without cover.
c. Size: Elongated.
d. Hinge Type: SC, self-sustaining, check, with Sta-Tite commercial fastening system.
e. Class: commercial.
f. Color: White.

2.4 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers, P301H, P302H, P303H, P601H:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. McGuire Manufacturing Co., Inc.
      b. Plumberex Specialty Products Inc.
      c. TRUEBRO, Inc.
      d. Zurn Industries
   2. Description: Manufactured plastic wraps for covering plumbing fixture hot and/or cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
   3. Where ADA skirt is installed under countertops, protective covers are not required.

2.5 FIXTURE SUPPORTS

A. All wall hung lavatories and water coolers shall be supported independently of the wall by a commercial floor mounted carrier consisting of rectangular steel uprights with welded feet and secured to floor with lead anchor inserts or self drilling expansion shields and lag bolts at each location. Wall brackets and conceal arms shall be provided where appropriate for fixture being supported. Leveling and locking hardware shall be provided for lavatory carrier concealed arm supports.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Josam Company.
   2. MIFAB Manufacturing Inc.
   3. Smith, Jay R. Mfg. Co.
   4. Zurn Plumbing Products Group; Specification Drainage Operation.
   5. Watts Drainage
   6. Wade

2.6 WATER CLOSETS

A. Water Closets, P106, P106H:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Standard Companies, Inc.
      b. Kohler Co.
      c. Zurn
      d. Sloan
      e. Toto
   2. Description: Accessible, floor-mounting, floor-outlet, white, elongated, 1.28 gpf vitreous-china fixture designed for flushometer valve operation, top spud with brass floor mounting hardware and bolt caps.
   3. All water closet bowl gaskets between floor and waste pipe connection shall be a combination of wax seal with plastic or urethane reinforced flanged polyethylene sleeve permanently molded into gasket assembly.
      a. Oatey Model No. 31194
      b. Hercules Plumbing Products Johni-Ring Model No. 90-220

c. Plastic Oddities Inc. Model BG-7k.

2.7 WALL HUNG LAVATORIES

A. Wall Hung Lavatories, P301H, P302H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Standard Companies, Inc.
   b. Kohler Co.
   c. Zurn
   d. Sloan
2. Description: Accessible, wall-mounting, white, vitreous-china fixture with 1 or 3-hole drilling, nominal 20" x 18" with backsplash and drilled for concealed arm supports and mounted on commercial floor carrier.

2.8 URINALS

A. Urinals: P203, P203H:
1. Products: Subject to compliance with requirements, provide products by one of the following:
   a. American Standard.
   b. Kohler Co.
   c. Zurn Industries, LLC.
2. Description: Accessible, wall-mounting, 2" back-outlet, vitreous-china fixture mounted on commercial floor carrier. 3/4” top spud, 1/8 gallon per flush.
3. Urinal waste arms from fixture outlet to connection at stack shall be 2” schedule 40 to extend 2” beyond face of finished wall with FERNCO 2”x1-1/2” reducing coupling.

2.9 MOP RECEPTOR BASINS

A. Mop Receptor Basins: P501:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kohler “Whitby No. K-6710-0 (Basis of Design)
   b. Stern Williams
   c. Acorn Engineering Company
   d. Florestone Prodects Company
2. Description: Flush-to-wall, floor-mounting, cast iron fixture with rim guard. 28" x 28" with 13" high curbs all around with 8” drop front. 3" drain outlet with grid strainer.

2.10 MOP RECEPTOR FAUCETS

A. Service Sink Faucets: P501:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. T & S Brass and Bronze Works, Inc.; B-0665-BSTP
   b. Speakman Company; SC-5812.

c. Zurn Plumbing Products Group; Commercial Brass Operation; Z843M1-CS.
d. American Standard; 8344012.002

2. Description: polished chrome plated, cast brass, integral check stops, vandal resistant four arm handles with color-coded indexes. Cast brass nozzle with 3/4" hose thread, pail hook and top brace. Brass vacuum breaker. Provided threaded brass wall escutcheon covers. ASSE-1001 compliant.

2.11 COUNTERTOP SINK FAUCETS

A. Sink Faucets, P601H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Chicago 786 Series (Basis of Design)
b. Elkay Manufacturing Co.
b. Just Manufacturing Company.
c. Kohler Co.
d. Delta No. 120-LF (Basis of Design)
2. Description: Deck-mounted manual faucet with 8" centers, 5-1/4" swing gooseneck spout. Include hot and cold-water indicators where required; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor. Faucets shall be furnished with 2.0 gpm vandal resistant aerators and 1/2" inlet shanks.
3. Where hot water temperature provided exceeds 110 degrees Fahrenheit, provide point of use adjustable tempering valve under lavatory below faucet connections and set to 105 degrees Fahrenheit.
4. Where only hot is provided, connect CW to both inlets.

2.12 DROP-IN STAINLESS-STEEL SINKS

A. Sinks, P601H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Elkay Manufacturing Co.
b. Just Manufacturing Company.
c. Kohler Co.
d. Moen, Inc.
2. Description: Single or two compartment, drop-in, self-rimming, 18-gauge, 300 series stainless steel sink. Drilling, depth, and size as scheduled. See basis of design fixture schedule at the end of this section for specific sink requirements.

2.13 DISHWASHER AIR-GAP FITTINGS

A. Dishwasher Air-Gap Fittings:
1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brass Craft Mfg. Co.; a Subsidiary of Masco Corporation.
b. Dearborn Brass; a div. of Moen, Inc.
c. Geberit Manufacturing, Inc.
d. Sioux Chief Manufacturing Company, Inc.

3. Description: Fitting suitable for use with domestic dishwashers and for deck mounting; with plastic body, chrome-plated brass cover; and capacity of at least 5 gpm and inlet pressure of at least 5 psig at a temperature of at least 140 deg F. Include 5/8-inch- ID inlet and 7/8-inch- ID outlet hose connections.
4. Hoses: Rubber and suitable for temperature of at least 140 deg F.

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 cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed. Coordinate countertop heights with Architectural plans and elevations.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 15 Section "Plumbing Valves."

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system. Cleanout plug in trap shall be accessible for removal of plug.

J. Install flushometer valves for manually operated accessible water closets and rough in with handle mounted on wide side of compartment as applicable. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install toilet seats on water closets.

L. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves. Faucet assemblies shall be set square to sinks and lavatories, with paired faucet handles set symmetrical in the off position.

M. Install traps on fixture outlets.
1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

N. Install deep escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

O. Set mop receptor basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

P. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

Q. Miscellaneous wall mounted items such as hose bibs, wash down fittings and flush valves shall have supplementary steel angles and a steel mounting plate securely attached to the wall framing to provide rigid support.

R. Install 1/2" check valves on hot and cold-water supplies to mop receptor faucet overhead between isolation stop valves and pipe drops to fixture.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

C. Replace washers, cartridges and/or seals of leaking and dripping flush valves, faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
   1. Remove faucet aerators and strainers, remove sediment and debris, and reinstall strainers and aerators.
   2. Remove sediment and debris from drains.
   3. Clean all floor drain grate tops and floor cleanout covers to like new condition.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

(EXCEPT FOR THE ATTACHED PLUMBING FIXTURE SCHEDULE)

PLUMBING FIXTURE SCHEDULE

P106 Water Closet - Floor Mounted - Flush Valve - 1.28 GPF - Kohler “Welcomme Ultra” No. K-96053 white vitreous china toilet, elongated siphon jet action bowl, two bolt caps, flush valve with solid ring stanchion secured to wall, white solid plastic open front heavy duty seat.

P106H Water Closet - Floor Mounted - Flush Valve - Handicap - 1.28 GPF - Kohler “Highcliff Ultra” No. K-96057, white vitreous china toilet, elongated siphon jet action bowl, two bolt caps, flush valve with solid ring stanchion secured to wall, and ADA handle, white solid plastic open front heavy-duty seat.

P203 Urinal - Wall Hung – 0.5 GPF - Kohler “Bardon” No. K-4991-ET-0, white vitreous china, siphon jet action with 3/4" top spud, 2" I.P.S. outlet, and manual flush valve, 3/4" spud, wall and spud flanges. Provide concealed floor mounted carrier, mount rim at 24" above finished floor.

P203H Urinal - Wall Hung – 0.5 GPF – Handicap - Kohler “Bardon” No. K-4991-ET-0, white vitreous china, siphon jet action with 3/4" top spud, 2" I.P.S. outlet, and manual flush valve, 3/4" spud, wall and spud flanges. Provide concealed floor mounted carrier, mount rim at 17" above finished floor.

P301H Lavatory - Wall Hung - Handicap - Kohler “Greenwich” No. K-2032 white vitreous china lavatory with concealed overflow, center set, faucet with .50 gpm aerator, McGuire Model No. 155WC offset grid drain assembly, McGuire No. 8872C-DF 1-1/4" chrome plated P-Trap with brass nuts, cleanout plug, and deep wall escutcheon, McGuire No. H170LK chrome plated copper supplies with angle stops, loose tee keys, and deep wall escutcheons. Provide floor mounted carrier with concealed arms. Mount 34” AFF. Provide handicapped covers on offset drain, p'trap and both supplies; Truebro Model 103W or equal.

P302H Lavatory – Drop-in - Handicap - Kohler “Memoirs Statley” No. K-2337 (22”x18”) white vitreous china lavatory with concealed overflow, faucet with .50 gpm aerator, McGuire Model No. 155WC offset grid drain assembly, McGuire No. 8872C-DF 1-1/4" chrome plated P-Trap with brass nuts, cleanout plug and deep wall escutcheon, and 12” braided hoses. McGuire No. H170LK supplies with angle stops, loose tee keys, deep wall escutcheons. Connect both faucet inlet shanks with cold water for fixtures indicated with cold water only. Provide handicapped covers on offset drain, p'trap and supplies where architectural cover is not provided with casework. Coordinate mounting with casework.

P303H Lavatory Station - Handicap – Bradley Verge Wash Basin LVSD3, faucets with .50 gpm aerator, McGuire Model No. 155WC offset grid drain assembly, McGuire No. 8872C-DF 1-1/4" chrome plated P-Trap with brass nuts, cleanout plug and deep wall escutcheon, and 12” braided hoses. McGuire No. H170LK supplies with angle stops, loose tee keys, deep wall escutcheons. Connect both faucet inlet shanks with cold water for fixtures indicated with cold water only. Provide handicapped covers on offset drain, p'trap and supplies where architectural cover is not provided with casework. Coordinate mounting with casework.

P501 Mop Receptor and Faucet – 28”x28” cast iron, porcelain enamel, floor mounted corner receptor with rim guard and faucet with hose. Mount faucet 48" AFF.

P601H Work Room Sink – Countertop - Single Compartment - Elkay Model No. LRAD-2219, 18 gauge type 304 stainless steel sink punched with 3 faucet holes on 4" centers, Elkay LK-35 cup strainers, 1-1/2" offset chrome plated tailpiece, and McGuire No. 8912C-DF - 1-1/2" chrome plated p-trap with brass nuts, cleanout plug and deep wall escutcheon, 8" center set sink faucet

with hose and spray, swing spout and 1/2" inlet shank connections, McGuire No. LFH170LK loose key angle stops, chrome plated copper tube supplies and deep wall escutcheons. Install in countertops provided by others; coordinate required roughing heights with countertop heights as indicated. Provide handicapped covers on offset drain, p'trap and both supplies. Add dishwasher drain tailpiece where required for installation of undercounter dishwasher drains.

P701H Shower Fittings - Handicapped - Symmons Model 1-117-FS-B24-X-2 pressure balancing mixing valve with single lever handle, flexible hand spray hose with 24" adjusting bar and in-line vacuum breaker, shower head and diverting valve, escutcheon and 2.2 gpm flow control. Tile surround by others. Contractor shall provide and install required safe pan and 3" floor drain (FD-1) with flashing flange for watertight finished installation. Mixing valve control shall be mounted at 44" A.F.F. and with centerline at 12" from entry opening to comply with ANSI A117.1 (Federal Handicapped Accessibility Code). Factory set temperature limit stops on shower valve to 105° F.

P902 Ice Maker Box - Wall Mounted - OATEY Model No. 38681 metal icemaker box with stop valve installed, adjustable mounting straps and face plate.

SECTION 227000
PLUMBING SYSTEMS TESTING

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 video inspection to confirm to design objectives for the following:
   1. Sanitary Waste Piping Systems
   2. Kitchen Waste Piping System

PART 2 - PRODUCTS AND PROCEDURES

2.1 VIDEO INSPECTION OF UNDERGROUND SEWER MAINS

A. The work specified in this section shall be performed by an independent contractor/consultant, who has had no involvement in the installation process. The contractor/consultant shall have had a minimum of three years experience in this type of work. The party performing the test shall indicate compliance in writing with these specifications and shall sign the report developed. To facilitate the work in this specification, the contractor will be provided with a drawing(s) showing the interior building layout with the layout of the underground piping system(s) with all floor cleanouts labeled with the same identifier as the as-built drawings. The contractor will use that same identifier throughout the documenting of the video inspection process and final report.

B. The contractor will provide a video pipe inspection of all sanitary sewer mains four inch in diameter and larger, inside the building, and all mains outside the building to the point of connection to the existing system or manhole. Sewer mains shall be considered to be any sewer collecting effluent from more than one group of plumbing fixtures, or whose run from one group of plumbing fixtures is over fifty feet. Inspections will begin at accessible points to the system, such as cleanouts or manholes. For pipe sizes 4-6 inch, accessible openings shall be no more than 100 feet apart, and for larger diameter piping no more than 300 feet apart.

C. For lines 4 inch – 6 inch in diameter, a color push camera system with a centering collar to raise the camera to the center of the pipe shall be used. The information on the screen will include displaying at the start of each segment the name of the contractor, date, time of day, and during the inspection the footage counter and most importantly the identification of from which point to which point (C.O. A-1 to B-1) the inspection is being done. The point references shall match

the identifiers on the as-built drawings. The final video shall be delivered on DVD or CD in a common format that can be played on a PC computer. Some of the common formats include MPEG, AVI, or similar.

D. For lines 8-inch and up, a main line camera system shall be used. This system shall have a pan and tilt camera and be equipped to provide the same display information as the push camera. The camera head shall be positioned as close to the centerline of the pipe as required to obtain a clear picture of the piping. The tractor moving the camera in the piping shall move at a speed no more than 0.5 feet per second.

E. A transmitter will be attached to the camera head to provide above ground location of underground problems.

F. The video pipe inspection shall observe and provide information on the condition of the pipe, joints, alignment, lateral locations, manholes, pipe size, pipe material and any pipe obstructions. The location of any underground problems shall be located above ground, and exact above ground location noted on the drawing and in the report.

G. Submit a final inspection report comprised of a DVD or CD of the inspection, a written inspection report, and a marked-up drawing showing the above ground locations of any underground problems. The written report shall identify each pipe segment inspected, pipe size and material of that segment, footage, laterals, detailed description of damages or other problems, summary of pipe condition, and counter time. The responsible person in charge of the project shall sign this report.

H. Notification of camera testing of underground lines shall be sent to Architects office 48 hours prior to actual test. The Owner's representative shall be present during the actual camera documentation of lines. A separate drawing shall be prepared showing all camera points of each area and submitted to the Owner. All retests of systems not properly cleaned and installed shall be at the expense of the Contractor.

I. The underground video report shall be submitted within 60 days of the last building pad slab on grade pour.

J. The final report shall be submitted 45 days prior to Substantial Completion.

PART 3 - EXECUTION

3.1 UNDERGROUND AND FINAL REPORT(S)

A. General: Typewritten, or computer printout in letter-quality bond paper, in three-ring binder, tabulated and divided into sections by tested systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing Engineer.

C. Report contents: In addition to certified field report data, include the following:

1. DVD or CD(s).
2. Drawings with corresponding data related to preparation of DVD or CD(s).

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
1. Title page.
2. Name and address of testing firm.
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 testing firm representative who certifies.
10. Table of Contents with the total number of pages defined for each section of the report.

E. System Diagrams: Include schematic layouts of Sanitary piping systems. Present each system with single-line diagram and include the following:
1. Start point of each segment.
2. Stop point of each segment.
3. System tag related to tape footage.
4. Pipe sizes and locations.

3.2 SITE OBSERVATIONS

A. The Contractor shall notify the Architect’s office 48 hours in advance of a Video Inspection. The Owner’s representative shall be present and witness the testing.

END OF SECTION 227000

SECTION 230500
COMMON WORK RESULTS 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 SUMMARY

A. See Editing Instruction No. 3 in the Evaluations for discussion about how this Section supplements other Division 23 Sections.

B. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. HVAC demolition.
3. Equipment installation requirements common to equipment sections.
4. Painting and finishing.
5. Concrete bases.
6. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. PVC: Polyvinyl chloride plastic.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.

D. Coordinate locations of floor drains and floor cleanouts with HVAC Equipment pads and units in all mechanical equipment rooms, closets and platform areas. Coordination layout drawings shall be prepared and coordinated by all trades.

E. No mechanical, plumbing or fire protection equipment, ductwork or piping shall be located overhead within 42" of electrical switchboards or panelboards.

F. No water piping (HVAC, domestic, storm, sanitary, or sprinkler) shall be located above electrical switchboards or panelboards. If the governing authority requires fire sprinklers in the

electrical rooms, spray shields shall be fabricated and installed to protect the live panels or switchboards from spray from sprinkler discharge.

G. Coordinate sanitary waste and vent stub ups and rainwater/downspout stub ups at slab on grade installations with structural plans to ensure that footings and/or grade beams are dropped or stepped to avoid piping penetrations thru footings and grade beams.

1.7 CODES AND REGULATIONS

A. All materials and workmanship shall comply with the latest editions of the following codes and standards, as applicable:

1. Manufacturer's Standardization Society (MSS) Standard Practice (SP) 58: Pipe Hangers and Supports - Materials, Design and Manufacture
2. MSS SP-69: Pipe Hangers and Supports - Selection and Application
3. MSS SP-69: Pipe Hangers and Supports - Fabrication and Installation Practices
4. National Fire Protection Association (NFPA) Pamphlet 13: Installation of Automatic Sprinkler Systems
5. NFPA 13: Installation of Sprinkler Systems
6. NFPA 24: Installation of Private Fire Service Mains and Their Appurtenances
7. NFPA 30: Flammable and Combustible Liquids Code
8. NFPA 90A: Installation of Air Conditioning and Ventilating Systems
9. NFPA 90B: Installation of Warm Air Heating and Air Conditioning Systems
10. NFPA 96: Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment
11. NFPA 101: Safety to Life from Fire in Buildings and Structures
12. NFPA 211: Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
13. NFPA 231: General Storage
14. National Electrical Code, 2017 Edition
15. International Mechanical Code, 2018 Edition, with Georgia Amendments
16. International Energy Conservation Code, 2015 Edition, with Georgia Amendments
17. International Building Code, 2018 Edition, with Georgia Amendments
18. International Plumbing Code, 2018 Edition, with Georgia Amendments
19. International Fuel Gas Code, 2018 Edition, with Georgia Amendments
20. International Fire Code, 2018 Edition, with Georgia Amendments
21. All local prevailing County codes and Ordinances

B. All workmanship and materials shall comply with all ordinances and regulations of all local authorities having jurisdiction.

C. Contractor shall obtain all permits and licenses, and pay all fees, as required for execution of the contract. Arrange for necessary inspections required by City, County, State and other authorities having jurisdiction, and deliver certificates of approval to the Owner. In compliance with the Georgia State Boiler Code, it is the responsibility of the Contractor (at his expense) to have each boiler and/or applicable pressure vessel inspected by a State of Georgia certified inspector upon installation of this equipment.

D. This inspection report shall be submitted to the Georgia Department of Labor, Safety Engineering Section, 501 Pullman Street, Room 210, Atlanta, Georgia 30312, Attention Chief Safety Engineer.

E. Upon the Georgia Department of Labor review of the inspection report and their inspection, they will place a tag indicating the State Serial Number on the inspected piece of equipment and issue a certificate of boiler or pressure vessel inspection. The original certificate issued is to be posted in the main Mechanical Room, with a copy sent to the Owner and one copy is to be included in the closeout documents.

1.8 RECORD DRAWINGS

A. As the work progresses, the Contractor shall maintain records and record all changes made daily on a set of contract mechanical drawings (HVAC, Plumbing & Fire Protection) during the progress of the work. The in-progress set of marked-up drawings, clearly showing the nature and extent of all changes, shall be maintained in the construction office at the site and clearly marked “Record Drawings”. The “Record Drawings” shall be up to date and available for use at the time of any job site visit by the Engineer or Architect. The completed “Record Drawings” shall be presented to the Architect upon completion and acceptance of the work. Final payment and “close-out” of the project shall be dependent upon receipt and acknowledgment of the completed “Record Drawings”.

B. The Engineer shall furnish to the Contractor electronic files of the Contract Drawings in AutoCAD format for the Contractors’ use in preparing a final electronic copy of the record drawings which shall incorporate all of changes made including all project addenda. Drawing changes shall be identified as follows:

1. The affected change shall be identified in an enclosed clouded area of a consistent color not used to indicate the noted change.
2. Each cloud shall have an identifier adjacent to the cloud identifying the date and origin of the change. (i.e., 1-12-06, Construction Directive, 1-12-06, Change Proposal, 1-12-06, Field Coordination, etc.).

C. Submission of electronic Record Drawings shall be made on compact disk in AutoCAD format and accompany one (1) full size set of bond plots in color on white background. Plots shall be generated from the CD of electronic files. Electronic file names and plot sheet numbering shall match Contract Document format.

1.9 ACCESS DOORS & PANELS

A. Furnish an access door and panels for each pipe and duct chase for each floor, fire dampers, etc. Size as required for access, 16" X 16" minimum.

B. Also, provide access doors in all non-removable ceilings and in partitions and walls where necessary to maintain access to fire dampers, manual dampers, valves, shock arrestors, and other mechanical devices requiring access.

C. Any access door installed in fire rated surface or assembly shall carry a U.L. Listing and an approved fire rating for that construction type.

D. Provide access doors/panels as required to test and reset automatic fire dampers.

E. Provide all access doors to the General Contractor for the timely inclusion in the building construction.

F. Refer to architectural section “08 31 13 – ACCESS DOORS AND FRAMES” for product’s construction and installation requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.2 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections “Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.3 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

D. Provide factory start up on all major pieces of equipment, with letter of certification stating proper installation is present for the following components:

Boilers
Cooling tower & Heat exchanger
Water Source Heat Pump Units
Roof mounted A/C units
Condensing units
Air-handling Units
Fan-Coil Units
Range Hood
Kitchen Hood
Controls System
Energy Management System
Energy Recovery Units
Outside Air Units
Variable Refrigerant Flow Systems
Pumps
Fans

3.5 SHOP DRAWINGS

A. Submit shop drawings along with an electronic formatted submittal for approval prior to commencing work. Hard copy shop drawings shall be bound in a three ring binder and shall include an index page with each item listed and referenced to sections with tabs. Tabs shall be cross referenced to index page. All shop drawings shall be prepared and submitted as a single package. **NO SHOP DRAWINGS WILL BE CHECKED UNTIL ALL HAVE BEEN SUBMITTED.** (HVAC controls submittals and any items with exceptionally long lead times that may affect the project completion date, as determined by the Engineer may be submitted separately). **Electronic shop drawings shall be a single PDF file and formatted as required for hard copy submittals. Each section shall be a bookmarked (tabbed) link named to describe the section. (ELECTRONIC SHOP DRAWINGS NOT PROPERLY FORMATTED WILL BE RETURNED UNCHECKED.)**

B. The following format shall be followed:

1. The submittal cover sheet shall include:

    a. Project Name
    b. Type of Shop Drawing including trade (HVAC, Plumbing, Fire Protection)
    c. Mechanical Contractor's Company Name
    d. Date of Submittal

2. The first sheet inside the submittal shall include all items on the cover sheet plus the following:

    a. Owner
    b. Architect
    c. Engineer
    d. Mechanical Contractor's Project Manager's Name

3. The supervising license holder(s) shall be identified, and a copy of their current valid license shall be included.
4. The second sheet shall include the following typed statement, signed and dated by the mechanical contractor's project manager:

    a. "The enclosed submittal (shop drawings) has been reviewed for accuracy of equipment and system quality and component quantities. The available voltages have been coordinated with the electrical contractor. All coordination items with other trades have been completed including structural, electrical, and other mechanical division disciplines prior to ordering any equipment."

C. The Contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the Engineer and shall include the form (found at the end of this section), Exhibit 1, entitled "Certification of Compliance - Shop Drawings" with each submittal prior to the index page and submittal data sheets. Failure to complete and execute this form will result in rejection of the submittal without review.

D. Each individual submittal item shall be marked to show Specifications Section and Paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc., so that the intended use of the equipment can be readily identified. Failure to make submittals accordingly shall be considered cause for rejection of shop drawings.

E. Submittals shall be supported by descriptive material, such as catalog cuts, diagrams, certified performance curves and charts published by the manufacturer to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. All literature shall clearly indicate the specified model number, options to be included, dimensions, arrangement, rating and characteristics of the proposed equipment. Capacities and ratings shall be based on conditions indicated or specified herein. Any deviations from specified equipment shall be clearly noted in red.

F. The Engineer will review the shop drawings for errors in the Contractor's interpretation of the design intent only. Corrections or comments made on shop drawings during review shall not relieve the Contractor from compliance with requirements of the contract documents, plans and specifications. Review of shop drawings shall not relieve the Contractor from the responsibility for conforming and correlating all quantities and dimensions, coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.

G. Review of shop drawings shall not permit any deviations from the plans and specifications nor shall it permit changes to the plans and specifications by the Engineer. Changes to or deviations from the contract documents are subject to the provisions of the General Conditions of the contract. Any required changes will then be issued by the Architect and executed by both the Owner and Contractor.

H. Each individual submittal item shall be marked to show Specifications Section and paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc., so that the intended use of the equipment can be readily identified. Shop drawings shall be submitted for each of the following items:

Fans
Air Distribution Devices
Roof Mounted Air Intake/Relief Hoods
Electric Heaters
Duct Access Panels
Gas Flues
Air-handling Units
Manual Dampers
Pumps
Boilers
Variable Refrigerant Flow Systems
Thermometers
Relief Valve
Hot Water Unit Heaters
Backflow Preventers
Plumbing Fixtures & Fittings
Valves & Unions
Shock Arrestors
Valve Schedules and Diagrams
Floor Drains
Sheet Lead Flashing
Pressure Reducing Valves
Pipe Accessories
Pipe Hangers, Supports & Accessories
Fire & Smoke Dampers
Automatic Dampers
Flexible Ductwork
Ductwork & Ductwork Construction
Vibration Isolation Equipment
Roof Mounted A/C Units
Condensing Units
Roof Curbs
Automatic Flow Control Valves
Heat Exchangers
Centrifugal Sediment Separator
Pressure Gauges
Kiln Hood
Pipe Identification Systems
Manholes and Accessories
Water Heaters & Accessories
Cleanouts & Accessories
Access Covers & Panels
Wall Hydrants & NFWH's
Gauges
Energy Recovery Units
HVAC Pipe Accessories
Bi-Polar Ionization Units
Contractor Start up forms

Flexible Pipe Hose Kits w/ Valves & Fittings Fan-coil Units
Kitchen Rangehood & Associated Fire Suppression System
Outside Air Units
Controls & Control Diagrams including Wiring Plans
Pipe & Duct Insulation & Accessories
Fire Protection: AHJ Approved Shop Drawings with Complete Hydraulic Analysis
Fire protection system valves and accessories
Supervisory switches & Flow switches
Precast concrete drainage structures and vaults
All equipment and systems training forms with a sign off blank
Underground piping systems

I. For miscellaneous items not listed here, contractor shall submit shop drawings for approval, unless the item is to be provided and installed **exactly** as specified, without variance.

J. Contractor shall provide a sign in sheet for each piece of equipment requiring Owner training noted in division 23. Training required for all equipment including the following: Water heaters, tempering valves, circulating pumps, HVAC pumps, electric heaters, boilers, cooling towers, water source heat pump units, condensing units, heat pump units, air handling unit, fan-coil units, rooftop units, split systems, energy recovery units, commercial kitchen hood, residential and commercial hood fire suppression systems and HVAC controls (controls shall include BAS as well as any non-BAS controls, i.e. wall mounted timers and wall mounted switches).

K. Submit evidence of welders' qualifications prior to performing any welds.

L. In addition, contractor shall prepare and submit dimensioned shop drawings (drawn at minimum 1/4"=1'-0" scale) of all ductwork, piping and equipment (HVAC) on the entire project. The drawings shall be created with computer aided drafting software. This shall also include actual mechanical room layouts, typical sections through corridors, pipe sleeves and other penetrations through slabs and walls for HVAC including fire and smoke walls. These shop drawings shall be submitted as PDF, along with a set of prints equal to the number of copies of submittals required by the Contract Documents.

END OF SECTION 23 05 00 (Except Exhibits No.1 and No.2)

SECTION 23 05 00 - Exhibit No. 1

CERTIFICATION OF COMPLIANCE - SHOP DRAWINGS

To:

Project:

I have reviewed the contract documents, including but not limited to specifications, drawings, addenda, and change orders. To the best of my knowledge the materials described by the enclosed shop drawings are consistent with and meet the requirements of the aforementioned documents. I further recognize that; 1) the engineers review is to assist me in complying with the documents by checking for errors in my interpretation of the requirements set forth in the contract documents, 2) review of shop drawings, by the engineer, shall not relieve me of my responsibility for confirming and correlating all quantities, dimensions and work with that of other trades, and for performing the work in a safe and satisfactory manner, and 3) review of shop drawings, by the engineer, shall not permit any deviations from plans and specifications.

I understand that I will be required to remove and replace at no additional cost to the owner any item found to be inconsistent with or not meet the requirements of the contract documents.

The undersigned states that the above is true to the best of his knowledge and that he has the authority to legally bind his firm to the above terms. Failure to provide a legally binding signature shall void submittal.

Sub Contractor:

By: _____ Date: _____

Ga. State License No (Required): _____

Title: _____

Company: _____

General Contractor:

By: _____ Date: _____

Title: _____

Company: _____

SECTION 23 05 00 - Exhibit No. 2

A/C Contractor shall make out start-up cards for all heat and cool units as per start up card furnished below and shall furnish same before substantial completion inspection for each phase of construction.

A/C CONTRACTOR'S START-UP CARD

School Name _____

HVAC Contractor _____

Unit #_____

Unit Model Number _____ Unit Serial Number _____

A/C EQUIPMENT

Rated Volts - _____
Rated Amps - _____

	COOLING	**HEATING**
Discharge Pressure	_____	_____
Suction Pressure	_____	_____
Return Air Temp.	_____	_____
Supply Air Temp.	_____	_____

GAS FIRED EQUIPMENT
(Boilers, etc.)

Unit # _____	Actual Manifold Pressure:	Mfg. Rated Manifold Pressure:
	_____	_____
	Actual Stack Pressure:	Rated Stack Pressure:
	_____	_____

ELECTRIC HEAT

Unit #_____	Actual Volts	Rated Volts	Rated Amps	Actual Amps
	_____	_____	_____	_____

SECTION 230593
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.

B. All work in this Section must comply with Section 230500 of these Specifications.

1.2 QUALIFICATIONS

A. An independent test and balance agency certified by the Associated Air Balance Council (AABC) that specializes in and whose business is limited solely to testing, adjusting and balancing air conditioning systems shall be retained and shall completely test and balance the HVAC system in complete accordance with Associated Air Balance Council Standards, latest edition, for total system balance. All work shall be performed under direct supervision of an AABC certified test and balance engineer.

1.3 QUALIFICATION SUBMITTALS

A. Testing and Balancing (TAB) Agency shall submit a company resume listing personnel and project experience in the field of air and hydronic system balancing. Submittal shall include an inventory of all instruments and devices used to test, adjust and balance systems and a working agenda which shall include procedures for testing and balancing each type of air and water system specified indicating all data to be recorded.

1.4 CONTRACT DOCUMENTS

A. Within 60 days of acceptance of contract, the TAB Agency shall obtain a complete set of Construction Documents, Equipment Specifications, and Equipment Submittals including all pertinent addenda items.

B. The TAB Agency shall be provided by the General Contractor or Mechanical Contractor the following items when issued or received:
1. Copies of all Addenda
2. Change Orders
3. Equipment Manufacturer’s Submittal Data
4. Mechanical Shop Drawings
5. Temperature Control Shop Drawings
6 Project Schedule

1.5 NOTIFICATION AND SCHEDULING

A. Before testing and balancing commences, the TAB Agency shall receive notification in writing from the Mechanical Contractor stating that the HVAC system(s) is operational, complete and ready for balancing. A complete system means more than just physical installation. The Mechanical Contractor shall certify that all prime movers: fans, pumps, refrigerant machines,

boilers, etc., are installed in good working order, and that full load performance has been preliminarily tested. Mechanical Contractor shall certify in writing that all equipment has been checked, started, adjusted and operated per the manufacturer's recommendations. Mechanical Contractor shall include copies of factory start-up reports for specified equipment.

B. The schedule for testing and balancing of the HVAC systems shall be established once notification has been received by the TAB Agency.

1.6 COORDINATION WITH OTHER TRADES

A. The owner or owner's representative, Mechanical Contractor, Temperature Control Subcontractor and the supplier of the HVAC equipment shall cooperate with the TAB Agency to provide all necessary data on design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

B. The TAB Agency shall coordinate the location and type of all taps, valves, sensors, damper, etc., as required for proper system testing and balancing with the Mechanical Contractor prior to beginning work.

C. The TAB Agency shall visit project before beginning initial testing and balancing to inspect installation of HVAC system, location and testing of all testing taps, etc., and provide a written report of all deficiencies to the Mechanical Contractor, Mechanical Engineer and Architect.

D. To bring the HVAC system(s) into a state of readiness for testing, adjusting and balancing, the installing Mechanical Contractor shall perform the following:
1. Activate all equipment in the cooling mode.
2. Activate all equipment in the heating mode
3. Run test all sequences of operation for controls and equipment.

1.7 AIR SYSTEMS

A. Ensure that all splitters, extractors, volume, smoke and fire dampers are properly located and functional. Dampers serving the requirements of smoke, outside air, return air and exhaust air shall provide tight closure and full opening, with smooth, free operation.

B. Verify that all supply, return, exhaust and transfer grilles, registers, diffusers are installed properly and free of objectionable noise.

C. Verify that all fans are operating and free of vibration. All fans and drives shall be checked for proper rotation and belt tension.

D. Install clean filters in all units prior to testing.

E. Make all necessary changes as required by the TAB Agency, at no additional charge to the owner.

F. Water Circulating System
1. Check all pumps for proper alignment and rotation.
2. Ensure that all water systems have been properly cleaned, strainers removed, cleaned, are full and free of air, that expansion tanks have been properly charged and that air vents have been installed in all high points in piping systems.

G. Temperature Control
1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, and fire and smoke dampers.
2. Verify that all sensors are calibrated and set for design operating conditions.
3. Make available to the TAB Agency any needed unique instruments for setting of D.D.C. controls.
4. Provide assistance and instruction to the TAB Agency in the proper use and settings of control components.

PART 2 - PRODUCTS

2.1 TESTING AND BALANCING INSTRUMENTS

A. Instruments used for testing and balancing must have been calibrated within a period of six (6) months prior to beginning testing and balancing of this project. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION PLAN CHECK AND REVIEW

A. The TAB Agency shall perform a preconstruction review of the contract documents and equipment submittals for their effect on the testing and balancing process. Review shall include location and type of volume dampers, air valves, balancing valves, flow metering stations, automatic control valves, pressure sensors, sheet metal and piping shop drawings.

B. Submit any recommendations for enhancements or changes to the system within 30 days of document review.

3.2 ON-GOING JOB SITE INSPECTIONS

A. During construction, the test and balance agency shall inspect the installation of pipe systems, sheet metal work, temperature controls and other component parts of the HVAC systems. Inspections shall be performed when 60% of the piping and or sheet work is installed and again when 90% of the total HVAC system is installed and prior to insulation of piping systems.

B. The balancing agency shall submit a written report of each inspection to the owner's representative, the Mechanical Engineer and the contractor responsible for correcting any noted deficiencies.

C. Inspections shall check for all necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.

D. Identify and evaluate any variations from system design.

E. Identify and report possible restrictions in systems (closed dampers, long runs of flexible ductwork, poorly designed or connected duct fittings, excessive piping losses, etc.).

3.3 RECORD & REPORT DATA

A. The Test and Balance report shall be complete with logs, data and records as required herein. Air and water flow quantities shall be balanced within 5% of the values specified in the contract documents. All logs, data and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the Testing and Balancing Agency's registered Professional Engineer.

B. Six copies of the Certified Test and Balance Reports shall be submitted to the Architect for review and acceptance.

C. The report shall include, but not be limited to, the following data.
1. Project Number
2. Contract Number
3. Project Title
4. Project Location
5. Project Architect
6. Project Mechanical Engineer
7. General Contractor
8. Mechanical Contractor
9. Date tests were preformed
10. Certification
11. General discussion of system(s) and any abnormalities or problems encountered.
12. Test and Report Forms

	AABC Form No.
Cover Sheet	89010
Instrument List	89020
Air Moving Equipment Test Sheet	89030
Exhaust Fan Data Sheet	89031
Return/Outside Air Data	89033
Air Distribution Test Sheet	89040
Temperature Readings	89043
Electric Heater Report	89050
Cooling Coil Data	89101
Combustion Test	89600
Other Forms as Required	-----

D. The following items shall be tested, balanced, adjusted as required for proper system operation:
1. Adjust all diffusers, grilles and registers to minimize drafts in all areas
2. Outdoor Air / Energy Recovery Units
3. Wall Mounted Air-Conditioning Units
4. Supply and Return Air Grilles and Diffusers
5. Supply & Exhaust Fans
6. Unit Heaters
7. Electric Heaters
8. Split Systems

E. Overall system(s) and installation for compliance with contract drawings and specifications.

3.4 CONTROL SYSTEM VERIFICATION

A. Verify that all control devices are properly connected

B. Verify that all dampers, valves and other controlled devices are operated by the intended controller.

C. Verify that all dampers and valves are in the position indicating by the controller (open, closed and modulating).

D. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions.

E. Check that all valves are properly installed in the piping system in relation to direction of flow and location.

F. Check the calibration of all controllers

G. Check the locations of all sensors to determine whether their position will allow them sense only the intended temperatures or pressures. Control contractor shall relocate as deemed necessary by the TAB Agency.

H. Check locations of all sensors, thermostats, etc., for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

I. Verify the operation of all interlocked systems.

J. Verify that all controller set points meet the design intent.

K. Perform all system verification to assure the safety of the system and its components.

3.5 SYSTEM PERFORMANCE VERIFICATION

A. At the time of final inspection, the Test and Balance Contractor shall recheck, in the presence of the owner’s representative random selections of data, air and hydronic quantities and other items recorded in the Certified Report.

B. Points and areas for recheck will be selected by the Owner’s representative and shall not exceed 25 percent of the total number tabulated in the Certified Report.

C. If random tests indicate a measured deviation in air or hydronic flow of ten percent or more from that recorded in the Certified Report, the complete report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Reports prepared and submitted, and new inspection tests made, all at no additional cost to the owner.

D. Following system verification of the Certified Report by the Owner’s Representative, the settings of all valves, splitter dampers, and other devices shall be permanently marked by the Test and Balance Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.

3.6 OPPOSITE SEASON TEST

A. Testing and Balancing Agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The TAB Agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

B. The Contractor shall resubmit six (6) copies of the complete test and balance reports to the Engineer for approval prior to final acceptance of the project.

END OF SECTION 230593

SECTION 23 0700
HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Insulation Materials:
      a. Mineral fiber.
      b. Polyisocyanurate.
      c. Polyolefin.
   2. Fire-rated insulation systems.
   3. Insulating cements.
   4. Adhesives.
   5. Sealants.
   6. Factory-applied jackets.
   7. Field-applied jackets.
   8. Tapes.

B. Related Sections:
   1. Division 22 Section "Plumbing Insulation."
   2. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.4 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. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per 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 and inspecting 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.

1.5 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.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork 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.

1.7 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 INSULATION MATERIALS

A. Comply with requirements in Part 3 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. 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 III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements:
   a. CertainTeed Corp.; Duct Wrap.
   b. Johns Manville; Microlite.

c. Knauf Insulation; Duct Wrap.
d. Owens Corning; All-Service Duct Wrap.

G. Polyisocyanurate: Unfaced, preformed, rigid cellular polyisocyanurate material intended for use as thermal insulation.
1. Products: Subject to compliance with requirements:
a. Apache Products Company; ISO-25.
b. Dow Chemical Company (The); Trymer.
c. Duna USA Inc.; Corafoam.
d. Elliott Company; Elfoam.
2. Comply with ASTM C 591, Type I or Type IV, except thermal conductivity (k-value) shall not exceed 0.19 Btu x in./h x sq. ft. x deg F at 75 deg F after 180 days of aging.
3. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less for thickness up to 1-1/2 inches as tested by ASTM E 84.
4. Fabricate shapes according to ASTM C 450 and ASTM C 585.

H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
1. Products: Subject to compliance with requirements,:
a. Armacell LLC; Tubolit.
b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.
c. RBX Corporation; Therma-cell.

I. Mineral-Fiber, Preformed Pipe Insulation:
1. Products:
a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Owens Corning; Fiberglas Pipe Insulation.
2. 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 Part 2 "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

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. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F .
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Products, Division of ITW; CP-96.
      b. Foster Products Corporation, H. B. Fuller Company; 81-33.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Products: Subject to compliance with requirements:
      a. Aeroflex USA Inc.; Aeroseal.
      b. Armacell LCC; 520 Adhesive.
      c. Foster Products Corporation, H. B. Fuller Company; 85-75.
      d. RBX Corporation; Rubatex Contact Adhesive.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements:
      a. Childers Products, Division of ITW; CP-82.
      b. Foster Products Corporation, H. B. Fuller Company; 85-20.
      c. ITW TACC, Division of Illinois Tool Works; S-90/80.
      d. Marathon Industries, Inc.; 225.
      e. Mon-Eco Industries, Inc.; 22-25.

E. 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. Products: Subject to compliance with requirements:
      a. Childers Products, Division of ITW; CP-82.
      b. Foster Products Corporation, H. B. Fuller Company; 85-20.
      c. ITW TACC, Division of Illinois Tool Works; S-90/80.
      d. Marathon Industries, Inc.; 225.
      e. Mon-Eco Industries, Inc.; 22-25.

2.4 SEALANTS

A. Joint Sealants:
   1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements,:
      a. Childers Products, Division of ITW; CP-76.
      b. Foster Products Corporation, H. B. Fuller Company; 30-45.
      c. Marathon Industries, Inc.; 405.
      d. Mon-Eco Industries, Inc.; 44-05.
      e. Pittsburgh Corning Corporation; Pittseal 444.
      f. Vimasco Corporation; 750.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Permanently flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 100 to plus 300 deg F .
   5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements:
      a. Childers Products, Division of ITW; CP-76-8.

b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.

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 .
5. Color: Aluminum.

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. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
3. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:
1. Products: Subject to compliance with requirements:
a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209 , 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: 3-mil- thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil- 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.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements,:
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
   b. Compac Corp.; 104 and 105.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
2. Width: 3 inches .
3. Thickness: 11.5 mils .
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch 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. Products: Subject to compliance with requirements,:
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   b. Compac Corp.; 110 and 111.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
   d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
2. Width: 3 inches .
3. Thickness: 6.5 mils .
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements,:
   a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   b. Compac Corp.; 120.
   c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
   d. Venture Tape; 3520 CW.
2. Width: 2 inches .
3. Thickness: 3.7 mils .
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

D. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
2. Width: 3 inches .
3. Film Thickness: 4 mils .
4. Adhesive Thickness: 1.5 mils .
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

E. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.
2. Width: 3 inches .
3. Film Thickness: 6 mils .
4. Adhesive Thickness: 1.5 mils .
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
   1. Verify that systems and equipment 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 thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F . 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 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 equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and 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 storage, application and finishing. Insulation that gets wet shall be replaced.

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 as recommended by insulation material manufacturer to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. 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.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. 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 .
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with staples, tape, and stainless steel wire.
1. All ducts with dimensions exceeding 18" shall have insulation secured with stainless steel wire wrapped on 4' centers
2. For ducts and plenums, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 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 2 times the insulation thickness but not less than 3 inches .

3. 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.

4. 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.

5. 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.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return.
4. Indoor, exposed return.
5. All duct associated with energy recovery unit.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. All return air, outdoor air intake, supply air, ERU supply, ERU return and any ducts with an internal temperature below 65 degrees F shall be insulated with mineral-fiber blanket: 2" thick and 0.75 lb/ft^3 nominal density.

3.8 PIPING INSULATION

A. All HVAC piping, other than heat pump loop piping, shall be insulated with minimum ½" thickness fiberglass or flexible Elastomeric insulation unless noted otherwise below.

B. Condensate and Equipment Drain Water below 60 Deg F:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.

C. Heating-Hot-Water (Boiler) Supply and Return, 200 Deg F and below:
   1. NPS 12 and Smaller: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe, Type I, 1-1/2 inches thick for piping up to 1-1/2", 2 inches thick, for piping 2" and greater.

D. Refrigerant Suction and Hot-Gas Tubing:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Flexible Elastomeric: 1 inch thick.
      b. Polyolefin: 1 inch thick.

3.8 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, vessels, and equipment. 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.

E. Install aluminum jacket over entire length of exterior mounted insulated refrigerant lines. Jacket shall extend through exterior wall into interior of building.

END OF SECTION 230700

SECTION 230900
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Direct Digital Temperature Control System (DDC) shall be an integrated, fully operational temperature control system and building management system as herein specified. The system hardware and software provided on the project shall be a new system designed by and fully compatible with the variable refrigerant flow system. The system shall also control all other equipment and systems installed at this facility. Equipment and software provided under this Specification shall be compatible and completely integrated with the existing hardware and software. The Contractor shall have full responsibility for all work necessary to satisfy the requirements of this Specification, including hardware and software integration.

B. The DDC System shall be a computer-based direct digital control system. Equipment shall be installed in the school as required to provide temperature control energy management and demand control, scheduling, and the control and monitoring of all points contained in the Facility Survey. The CCU, RSUs, and UDCs shall make up a distributed processing control system with all hardware and software being provided by the Contractor. All hardware and software provided shall be fully integrated and compatible with the Owner's existing system.

1.02 SCOPE OF WORK

A. The equipment and services to be provided under this section shall include the following:

1. Provide new controllers and interface for the replacement system.

2. Provide new controllers and interface for the replacement energy recovery units.

3. Direct digital temperature control of all heating, ventilating and air conditioning equipment.

2. Existing lighting controls shall be modified to separate the interior and exterior lighting.

3. Control and monitoring of all other equipment as shown on the control point list.

4. Energy optimization using timing schedule, optimal start-stop, temperature setback, duty cycle control, and DDC,

5. Automatic two-way communication between the school and the existing central maintenance office computer system shall be maintained.

6. Preparation of project drawings, wiring diagrams, and database generation as required to store as-built documents on Owner’s system.

7. Check out and startup of the system including demonstration that all systems are operational in all modes and integrated with all existing systems. Check-out test Documentation shall be stored on Owner’s existing system.

1.03 ACCEPTABLE MANUFACTURERS

A. The manufacturer for the automatic controls shall be Distech Controls.

1.04 TRAINING

A. The Contractor shall provide, at no additional charge, a minimum of 8 hours of on-site instruction to familiarize Owner personnel with the capabilities, operation, and routine maintenance of the DDC system. The instruction shall include equipment functional descriptions, installation procedures, system start-up, system operation, and general system troubleshooting. All instruction shall be provided by factory-trained personnel.

C. Contractor shall provide operation and maintenance manuals for the DDC system and all peripheral equipment in digital format. Updates to all manuals shall be provided free during the warranty period. This information shall be stored on the Owners electronic data system.

1.05 WARRANTY

A. Contractor shall provide a one year labor and material warranty for all equipment and software. The warranty shall include on-site service and equipment repair or replacement at no charge to Owner. Response time of maintenance personnel shall not exceed 24 hours after notification of Contractor that service is needed. The warranty period shall begin on the date of "Substantial Completion".

B. Contractor shall provide factory-trained personnel to service the DDC system and maintain a reasonable local stock of replacement parts to assure prompt and dependable repair of DDC system equipment problems.

C. The Contractor and Manufacturer shall maintain a service center with equipment capable of communicating with the RSUs and the CCU to assist Owner personnel using Ethernet.

1.06 WORK PROVIDED UNDER DIVISION 26

A. The following items are to be provided under Division 26 of the specifications:

1. Ethernet RJ45 connection to Owner's network with a static IP address.
2. A 120 volt power supply to feed the RSU panel located in the main server room or other location approved by the Owner, and also wired through the emergency power system.

1.07 SYSTEM ACCEPTANCE

A. The system acceptance procedure shall include as a minimum the following requirements:

1. Demonstrate all specified capabilities of the CCU, RSU, and UDC,
2. Demonstrate all operator commands and program features,
3. Verify that all control points, status inputs, and analog inputs can be controlled or monitored from the RDC, RSU and CCU locations,

4. Verify that all alarm inputs are properly handled,
5. Demonstrate program loading and parameter modification,
6. Demonstrate program integrity after power failure,
7. Demonstrate telephone and network communications between CCU and all RSUs whether initiated by the CCU or the RSU,
8. Demonstrate capabilities required by Specification but not initially installed in accordance with the Facility Survey.
9. Demonstrate the automatic generation and delivery of all required reports.

PART 2 - PRODUCTS

2.01 CENTRAL CONTROL UNIT

A. The Owner currently has in operation a CCU containing a computer with sufficient memory, operator terminal, printer, automatic dialing unit, and software for all specified capabilities. The CCU is capable of communication with up to 199 RSUs by means of Ethernet using the Owner's EMS LAN network, and a wireless path where Owner's network is not available.

B. The Building Management System including the PC Central Management Information System with dynamic status display, automatic data collection and analysis, and global communications.

C. Central CCU and remote maintenance center CCUs must operate in a wide area network using the Owner's network to provide for specific regional control as well as full information sharing between regional maintenance centers.

D. The existing CCU shall coordinate all alarm and advisory messages from remote sites. Messages shall be logged into an historical database and redirected to specific maintenance centers based upon the site reporting and the type of message. The CCU alarm system shall record processing information into the historical database and produce basic management alarm summary report. The CCU shall also be able to redirect owner selected alarms via e-mail or pagers.

E. The CCU shall coordinate all scheduling of zones through the existing Lotus Notes e-mail schedule request forms. Remote site controllers must interface with the existing schedule formats and handle all required automated schedule updates and confirmation sequences.

F. Flex-graphics Web pages of remote sites shall be provided on the CCU or RSU web server. The site web pages shall include current operating conditions for the building mechanical systems. Detailed room information for each room shall be provided for current status of fan, heating and cooling, supply air temperature, set-point, points need to be defined. The web pages shall also provide access to selected site historical trend information in either a web page or PDF format.

2.02 REMOTE SITE UNIT

A. The RSU shall be a computer-based unit capable of operating as a stand-alone system for single building control and as an intelligent remote site controller in a distributed processing system. The RSU shall be fully compatible with the Owner's CCU hardware and software

and shall perform energy control functions such as demand control, equipment scheduling, duty cycling, reporting, analog and digital monitoring, optimization, and direct digital control. The system shall provide temperature control of heating, ventilating, and air conditioning units.

*B. *Not Used.*

2.03 UNITARY DEVICE CONTROLLER

A. Unitary Device Controllers (UDC) shall be provided as required to control all equipment as specified on the control point list. The UDC shall communicate with the RSU through its RS-485 LAN at 9600 baud via a 2-wire network. The UDC shall be a complete control subsystem with microprocessor, memory, control programs, and user-defined application programs. All UDCs shall be identical in hardware and software with the exception of user-defined databases so that only one type of spare board is required.

B. The following description shall apply to all UDC controllers whether controlling a roof top unit, heat pump, central loop or other HVAC equipment:

1. The Unitary Device Controller (UDC) shall be a complete control subsystem including microprocessor, power supply, 10 year battery backed RAM memory, real time clock and calendar, input-output interfaces, LAN interface, Soap/LAN Bus Extender interface device, and firmware.

2. The LAN interface shall be an industry standard RS-485 network communicating at 9600 baud on a single pair line to the RSU. Up to 120 UDCs shall be able to operate on the same pair with the RSU. LANs shall be configured as to have approximately 40 controllers on each LAN. Each controller shall be functional as an independent control system or as an integrated subsystem of the RSU when connected to the RSU LAN.

3. The UDC shall provide plug-in support for two remote thermostats to allow independent temperature control of two zones. A compatible thermostat shall be provided with space temperature sensor, timed override switch, override indication LED, and software-controlled local temperature adjustment.

4. Unitary controllers shall be provided as indicated on the project drawings. All UDCs supplied under the Specification shall be identical in hardware and software, with the exception of user-defined facility database so that only one type of spare board is required. Systems that use dedicated design or firmware for a particular unitary function are not acceptable. There shall be no address jumpers, configuration switches or field calibration pots on the controller.

5. The unitary controller shall operate from 24 VAC using a separate control transformer or power from the controlled equipment of 24 VDC external power source. The power input shall be protected from power transients.

6. The unitary controller shall be track-mounted in a standard 3.25 inch PVC track. All wire connections shall be made using plug-in screw terminal blocks which allow the

board to be exchanged without disconnecting any wires. Optional thermostats shall be located up to 50 feet from the controller using quick disconnect cables.

7. The unitary controller shall provide the following control capacity:

   a. Digital Outputs - UDCs shall provide eight digital outputs with opto-isolated triac drivers. Each digital output shall have a corresponding LED to indicate it status.

   b. Digital Inputs - The UDC shall provide 12 opto-isolated digital input devices with status LEDs. One of the digital inputs shall also be associated with counter registers.

   c. Analog Inputs - UDCs shall have eight universal digital / analog inputs. Analog inputs shall have a full 10-bit analog-to-digital resolution. UDCs with 8-bit resolution are not acceptable.

   d. Analog Outputs - Three channels of analog outputs with a full 10-bit digital-to-analog conversion shall be provided. Analog outputs shall be 4-20 MA or 0-10 VDC. The controller shall provide 15 VDC output for use with externally powered transmitters, humidity sensors, and other powered devices. UDCs with 8-bit resolution are not acceptable.

8. DDC setpoint control shall be provided for the analog outputs. Each setpoint shall have full PID control and shall function in either a fixed base or floating mode.

9. UDCs shall be programmed with the CCU via Owner's LAN network or dial-up phone lines. In addition, a portable computer shall be attachable to the UDC LAN at the controller, thermostat, RSU or any point on the UDC LAN. The computer shall also monitor activity, directly command any UDC, change parameters, or upload/download database parameters.

10. The UDC shall network with other UDC networks via fiber LANs to allow multiple "islands" of UDCs to function as an integral network.

2.04 SENSORS AND CONTROLS

All analog sensors, control relays, and status sensors shall be provided to properly interface the UDCs with the building equipment as specified in the Facility Survey. The sensors and controls shall be new equipment installed in accordance with the manufacturer's recommendations.

A. Temperature Sensors

1. Temperature sensors shall be Platinum Resistance Temperature Detectors (RTD) or Thermistors with a temperature range of –30 degrees F to 275 degrees F. Sensors shall be wire-wound platinum with a nominal resistance of 100 ohms at 32 degrees F or 10k thermistors with a nominal resistance of 10,000 ohms at 77 degrees F. Interchangeability tolerance at 70 degrees F shall not exceed 0.75 degrees F without field calibration. Wiring from RTD sensors shall be 3-wire or 4-wire configuration to minimize lead wire resistance effects. All temperature sensors shall be supplied by the manufacturer.

2. The sensors shall be housed in enclosures appropriate for the application. As a minimum, four types shall be available:

   a. Molded executive plastic unit suitable for wall mounting to sense room space temperatures;
   b. Metal thermowell unit suitable for mounting in pipes to sense chilled and hot water temperatures;
   c. Metal duct mounted unit suitable for mounting in air ducts; and
   d. Metal outside air unit with sunshield and housing suitable for mounting outdoors.

3. Sensors with insertion-type housing shall provide 3, 6, 12 or 18 inch insertion depths as required for best temperature sensing.

B. Control Relays

1. Control relays shall be 24 VAC coil-operated devices with contacts rated for the voltage and current requirements of the equipment to be controlled. Relays shall be plug-in type with sockets having screw terminals for control circuits of 10 amps or less and non-plug-in type for control circuits exceeding 10 amps. Contact configuration shall be as required to properly interface with controlled equipment. All relays shall be UL listed.

C. Status Sensors

Status sensors shall be provided for all controlled equipment. Dry contact status inputs shall provide binary state information from the following types of equipment:

1. Air flow status for air handlers, fans, and blowers shall be sensed by differential pressure transducers properly sized for the flow sensors unless otherwise specified as digital binary switches;
2. Liquid flow status of chillers, boilers, and pumps shall be sensed by differential pressure switches rated for media and pressure unless otherwise specified as flow transducers;
3. Equipment status of chillers, boilers, lights, heaters, alarm annunciators shall be sensed by auxiliary relay contacts; and
4. Temperature condition of coolers and freezers shall be sensed by analog temperature sensors unless otherwise specified, as setpoint thermostats.

D. Humidity Sensors

1. Humidity sensors shall be ultra-fast response polymer capacitance or other Owner approved sensor type with internal temperature compensation. The sensor shall measure the range 0 to 100% RH with an accuracy of +/- 3% RH between 15 and 95% RH. Duct sensor housing shall be stainless steel with mounting brackets as required to protect the sensor and provide proper orientation to the air flow. Wall mounted sensors shall be an executive molded plastic style housing.

2. Provide and install one sensor per ERU for each floor the unit serves. Locate sensor near center of area being served by the ERU. Sensor should be connected to the nearest ERU controller. Other sensors shall be mounted at locations as shown on the drawings.

E. CO2 Sensors

1. CO2 sensors shall have a range of 0 - 2000 ppm. Accuracy shall be within 50 ppm in a 60 - 90 degree F range with a maximum drift of 10 ppm per year.

2. Provide and install one sensor per ERU. Locate sensor in the exhaust air of the ERU. Sensor should be connected to the nearest ERU controller.

2.05 NAMEPLATES

A. Each major item of equipment shall have the manufacturer's name, model number, and serial number permanently attached to the unit.

B. Label the ceiling grid to identify each UUC location.

2.06 COMPLIANCE

A. All controllers and equipment shall be UL-916 Listed and FCC approved as required.

2.07 SOFTWARE

A. The Contractor shall provide all software programs required to provide a completely operational system as described in this Specification. Distribution copies of all software shall be provided on CD-ROM or DVD disks for loading into the CCU hard disk. Duplicate copies of all disks shall be provided.

B. The software shall be provided for use by the Owner on the system hardware under license covering the period that the DDC system is installed in the Owner's facility. During the one-year warranty period, standard software updates shall be provided without charge. No license renewal or other fees shall be required for continuous use of the system by the Owner.

2.08 FACILITY INFORMATION CENTER

A. Facility Information Center

1. The existing DDC Building Management System shall remain, and new components shall be re-connected.

2.09 LOOP WATER CONTROL PANEL

A. The existing circulation loop water control panel shall remain. Re-connect new equipment to the panel.

2.10 WATER SOURCE HEAT PUMP AND DAMPER ACTUATOR

A. Provide Siemens model GMA126.1P for water source heat pump unit’s control valve and damper actuators. Coordinate electrical characteristics with electrical and equipment provided.
   a. Rotary

b. Bi-directional fail-safe Spring Return
    i. Spring returns the actuator to a fail-safe position in <15 seconds in response to a loss of power.
c. 2-Position Control
d. 90 Second Run Time
e. Dual Auxiliary Switches
f. Plenum Rated

PART 3 - EXECUTION

3.01 DEVICE LOCATIONS

A. Unless otherwise noted, install mechanical room devices, instruments, and panels 4'-0" above floor. Install adjustable room sensors at 4'-0" above floor.

B. Locate damper motors outside of the air stream where possible.

C. Room sensors shall be located to prevent supply air from blowing directly on sensors. Coordinate conduit runs with the electrical contractor. Coordinate sensor location so as not to interfere with blackboards, shelves, etc.

3.02 IDENTIFICATION

A. Controls, switches, night thermostats, starters, contactors and related devices shall be identified with engraved laminated plastic nameplates. Plate shall show function, system and control device identification number as indicated on the control drawing.

3.03 CONTROL WIRING

A. Install control, pilot circuit and interlock wiring through interposed safety or auxiliary control devices required for operation of the equipment. All wiring installed exposed in an occupied space, exposed in a mechanical room, concealed inside a wall, concealed above a non-accessible ceiling, or above ground on the exterior of the building, or underground shall be run in conduit. All line voltage wiring shall be installed in conduit. All low voltage wiring installed above accessible ceilings may be installed without conduit by using cable U.L. listed for use in return air plenums. Control and/or interlock wiring shall not be run in conduit with any power wiring other than that serving the equipment controlled. Color and appearance of wiring shall be consistent for each service type throughout project. All control communications lines shall be yellow in color. All cabling to room sensors and any other type of sensor shall be orange in color. All cabling to miscellaneous equipment including trap primers, heaters, fans, and lighting controls shall be white with an orange stripe.

B. Electrical wiring shall conform in all respects with the provisions of the National Electrical Code and the Electrical work specifications of Division 26.

C. Wires shall be identified at both ends with numbered labels to correspond to conductor numbers on the control diagrams.

D. Junction box covers concealed above ceilings or exposed in mechanical or electrical rooms shall be labeled using black, indelible marker to indicate which units are served by the control circuits contained in the box. Device plates exposed in occupied spaces shall not be labeled.

E. Control voltage shall be a maximum of 24V, unless otherwise indicated, specified or required.

F. Wiring connections to terminal posts shall be made by means of compression type lugs. Wire splices shall be made with scotch locks.

G. Provide a separate numbered terminal connection for each wire entering panel.

H. Safety devices in motor control circuits shall be wired to interrupt the holding coil circuit, regardless of the position of any selector switches in the circuit.

I. Control circuit conductors shall be sized for a minimum voltage drop between the supply device and the farthest controlled device.

J. Plenum rated cable in corridor ceiling spaces shall be routed in cable hangers. Hangers shall be provided under division 26. All energy management cables shall be fastened together within the designated hanger and tied with a cable tie. Details indicating the required location for all system wiring are located on the drawings. Where cable hangers are not located, plenum rated cable shall be fastened to the building structure at 6'-0" on center with cable ties.

K. Cable ties shall be plenum rated type, PAN-TY PL-702 or approved equal.

L. Plenum rated cable penetrating fire rated or smoke rated walls shall be installed to maintain the wall rating. A conduit with bushings on each end shall be installed in the wall. After cable is installed thru the conduit, the annular space between the cable and the conduit wall shall be filled with fire rated caulk. The annular space between the conduit and wall opening shall be filled with fire rated caulk. If annular space between conduit and a concrete block wall exceeds 1/8", space shall be patched with grout prior to applying fire rated caulk.

3.04 SMOKE DETECTOR SYSTEM

A. Smoke detectors approved for duct installation shall be provided for air systems of 2000 CFM capacity or above to automatically shut down the supply fan. Smoke detectors shall meet the expressed requirements of Section 90A of the NFPA Code including extra contacts for wiring to the building fire alarm system. Duct mounted smoke detectors shall be installed and wired to the HVAC equipment served under Division 23. Detectors shall be provided and wired to the building fire alarm system under Division 26. Contractor shall coordinate all requirements of smoke detectors to facilitate interface with the building fire alarm system with Division 26. Installed by mechanical.

B. Smoke detectors shall be included in (but not be limited to) all systems as labeled in equipment schedules. Smoke detectors for all units shall be located in the supply air duct at the unit prior to any branch take-offs.

3.05 FIRE ALARM INTERLOCK, EQUIPMENT INTERLOCK AND EMERGENCY

A. Provide, in the Central Plant, an "Emergency Stop" switch. Switch shall be wired through the BAS so that all air moving equipment (except kitchen hood supply and exhaust fans) will immediately shut down when switch is depressed. Switch shall be “mushroom” type and shall be resettable. Switch shall be mounted at 4’-0” A.F.F and housed in a clear polycarbonate alarm stopper cover.

B. Provide all interlock wiring between air-conditioning units, fans, dampers, space sensors, clocks, and other related equipment as necessary to achieve the specified operating sequence.

C. Duct mounted smoke detectors shall be wired to the fire alarm systems per NFPA 72.

PART 4 - SEQUENCE OF OPERATIONS

4.01 GENERAL

A. The system shall be an extension of the existing control system serving this campus. Refer to I/O summary for additional control point descriptions.

4.02 ROOFTOP UNITS WITH DEHUMIDIFICATION CONTROLS

A. Rooftop air conditioning units shall be operated by a local SLC and associated unit controls interlocked with the central BAS panel via BACnet interface.

B. Units shall be energized by a signal from the BAS, the evaporator fan shall run continuously during occupied hours and cycle through the thermostat during un-occupied hours. Heat and cooling shall be thermostatically controlled (set 76 degrees F. cooling, 70 degrees F. heating, adjustable). Night setback shall be set 55 degrees F heating, night set-up shall be set 80 degrees F.

C. Outside air dampers shall remain closed whenever return air temperatures are below 65 degrees F. (adjustable). Dampers shall open to minimum position during occupied hours except when ambient conditions (as sensed by an enthalpy controller) permit free cooling in the economizer mode.

D. A space mounted humidity sensor will monitor the space relative humidity. The DDC system will maintain the space humidity level at 55%RH (adjustable). When the space humidity level rises above 55%RH (occupied or unoccupied), the dehumidification circuit will be enabled on the unit. Unit operation of dehumidification circuit shall operate on factory integral controls. If the space humidity level reaches 60% RH, the DDC system will generate an alarm.

4.03 DUCTLESS SPLIT SYSTEMS

A. Control module shall be provided for each split system to control the evaporator fan, and remote condensing unit or outdoor heat pump unit. A wall mounted temperature sensor located in the space shall provide an analog input signal to the control module.

B. Each split system shall be programmed to start and stop according to the day/night schedule provided by the Owner.

C. Each split system shall be capable of remote start and stop (enable/disable).

D. The unit evaporator fan shall run continuously in the day cycle.

E. On a rise in space temperature above the cooling set point, the compressor shall start. Provide two stage control for units with two steps of capacity.

F. On a drop in space temperature below the heating set point, heat pump unit compressors shall be on and the reversing valve shall be engaged.

G. In the night cycle the unit fan shall be off. On a drop in space temperature below the night setting of 55 degrees F., the fan shall start and the heating cycle shall be on.

H. Units serving data rooms and electrical rooms shall be capable of disable/enable but initially be scheduled enabled. Data rooms and electrical rooms temperatures shall be monitored.

I. Provide fan status monitoring for the supply fan.

4.04 OUTDOOR AIR UNITS/DOAS

A. Each unit shall be provided with a BACnet factory controller to operate the unit. The BACnet interface shall provide the points as summarized below.

4.05 TYPICAL SEQUENCE OF OPERATIONS AND REQUIREMENTS FOR VRFs

A. Operation of VRF Units (adjustable)
1. Set-Up
a. Return air averaging sensor has been disabled and unit runs off of space sensor.
1) Note: Not applicable for restroom and corridor units. These units run off of RA sensor.
b. Unit has been set up for single set point mode.
Fan is set to Auto Mode.
c. Occupant Fan control is disabled.
Occupant has on/off control.
d. Thermostat on/off dead band changed to 1°F.
Discharge blades locked at 0°.
e. Nav. Controller face template has been installed.
2. Start Mode
a. Unit is enabled according to user definable schedule in BMS.

3. Optimal Start/Morning Warm-Up/Morning Cool Down
   a. Unit starts morning warm up and cool down mode based on optimal run time so that the space temperatures are at set point before scheduled occupancy.

   During morning warm-up, cooling disabled and heating enabled as needed to reach space temperature set point.

   b. During morning cool down, heating is disabled, supply fan shall be enabled and cooling shall be enabled as needed.
4. Occupied Mode
   a. Unit cycles fan to maintain heating or cooling set points.

   Unit enables heating and cooling when space temperature exceeds heating or cooling set points.

   b. Unit runs in order to maintain space temperature set point of 73 [°F] +/- 1 [°F].

   If unit is in cooling mode and space temperature rises > 1 [°F] (adj.) above set point, unit goes into active cooling. Controlled by equipment manufacturer.

   c. If unit is in heating mode and space temperature drops > 1 [°F] (adj.) below set point, unit goes into active heating. Controlled by equipment manufacturer.

   A temperature adjustment slide on the zone sensor shall allow the local set point to be adjusted from 70 to 76 [°F].

   d. Unit changes mode from heating/cooling when space temperature is 1.9 [°F] from set point. Controlled by controls contractor.

   Unit responds to adjustment of set point of the space temperature thermostat.
5. Unoccupied Mode
   a. In unoccupied mode, the VRF utilizes unoccupied set points and resets to occupied mode upon a signal from BMS controls system.

   If space temperature drifts below night set-back temperature set point range of 65 - 78 (adj.) unit shall be enabled to satisfy set point until space is greater than 4 °F (adj.) inside set-back temperature set point range.

   b. On a rise in space humidity above 62 [°F WB] (adj.) unit shall energize the dehumidification mode until wet bulb temperature of the space is less than 60 [°F WB] (adj.).

   Unit can be enabled during unoccupied mode to operate in occupied mode from space sensor via occupancy switch on zone thermostat. Unit will remain in occupied mode until next scheduled unoccupied mode unless turned off at switch.
6. Dehumidification Mode/Dry Mode (Controlled by controls contractor)
   a. Dry mode operates when unit is not in active cooling or heating.

   Dry mode is enabled to operate when space < ± 0.9 [°F] (adj.) from set point.

   b. In occupied mode, dehumidification operates when the space relative humidity is greater than the humidity set point of 57 ± 3 [% RH] (adj.). When operating in dehumidification mode the unit should go to in to cooling mode and slow down supply fan or otherwise known as dry mode. The unit should stay in dehumidification mode until the relative humidity of the space is less than 54 [% RH] (adj.).

   In unoccupied mode, dehumidification operates when the space wet bulb temperature is greater than set point of 62 [°F WB] (adj.). When operating in dehumidification mode the unit should go to in to cooling mode and slow down supply fan or otherwise known as dry mode The unit shall stay in dehumidification mode until the wet bulb temperature of the space is less than 60 [°F WB] (adj.).

   c. Note:

1) Restroom VRFs do not require humidity sensor and shall not go into dry mode. Corridor cassettes should have area humidity sensors to enable dry mode per cluster.

B. Alarms and Shutdowns
1. Unit shuts down and BMS alarms upon activation of condensate overflow switch.
Unit shuts down and BMS alarms upon activation of fire alarm.
2. BMS alarms on dirty filter.
BMS alarms on motor failure to start.
3. BMS alarms on low refrigerant pressure.

C. BMS shall monitor and display
1. Unit factory controller interfaces with BMS system to monitor available points.
Unit and tag I.D.
2. Fan status.
Space temperature
3. Zone humidity
Space temperature set point
4. Zone humidity set point
Fan speed
5. Operation mode

D. Provide interface with VRF system space sensors.

4.06 OUTSIDE AIR UNITS/DOAS

A. A control module shall be provided for each unit. Unit shall interface via BACnet. ALC shall work with the unit manufacturer to coordinate interface and control of these units.

B. Unit controls will be provided by the unit manufacturer. ALC shall interface to the unit with the minimum of these control capabilities:
1. Enable/disable the unit
2. Read and adjust evaporator discharge temperature
3. Read and adjust unit discharge temperature (Heating, Cooling and Dehumidification)
4. Read the temperature and humidity of the air at the following locations:
   a. Supply side: Below energy wheel, after energy wheel, before evaporator, after evaporator and leveling unit after the heating section.
   b. Return side: Entering unit from building, before energy wheel and after energy wheel.
5. Compressor status
6. Fans status
7. Filter status
8. Heating status
9. Enable/disable recirculation mode
10. Enable/disable cooling mode
11. Enable/disable dehumidification mode

C. Alarms

1. Critical Alarms(require reset, unit shutoff)
   a. Supply air flow
   b. Exhaust air flow
   c. Reactivation air flow
   d. Supply fan motor overload fault
   e. Exhaust fan motor overload fault
   f. Reactivation fan motor overload fault
   g. Smoke
   h. Heat fail & Supply Air Temp < 55°F
2. Non-Critical Alarms(require reset)
   a. DH Wheel motor overload
   b. DH Wheel rotation
   c. Low suction pressure: Comp. A
   d. High discharge pressure: Comp. A
   e. Low differential pressure: Comp. A
   f. Enthalpy Wheel rotation
   g. Enthalpy Wheel motor fault
   h. Low suction pressure: Compressor B
   i. High discharge pressure: Compressor B
   j. Low differential pressure: Compressor B
   k. Sensors
3. Alarm Notes
   a. All resettable alarms can be reset through the BACview display or BMS.
   b. If the alarm persists after resetting it, the root cause remains.
   c. The sensor alarms cannot be reset, as the sensor is reading out of the expected range. The sensor must be put into range to clear the alarm.

D. Each unit shall be programmed to start and stop according to the occupied/un-occupied schedule provided by Owner. The units shall not operate in the un-occupied mode, unless in recirculation mode.

E. A duct mounted smoke detector located in the exhaust air inlet duct of the unit shall shut down both fans in the unit.

4.07 LIGHTING CONTROLS

A. Lighting controls shall be by division 26.

4.08 EXHAUST FANS

A. Refer to fan schedule for control requirements. Coordinate control with dampers, fans and temperature sensors.

4.09 EMERGENCY OPERATIONS

A. Main control panel shall be connected to the emergency generator. This will be the only panel with emergency power. All additional power required under emergency conditions will be the

responsibility of the controls contractor to obtain from this power source. Provide a current transformer as required for the available emergency circuit voltage and phase.

B. The emergency generator points shall include alarm indication, over-crank indication, and run-time hour counter.

C. A manual override shutdown button shall be located in the central administration office adjacent to the fire alarm annunciator panel. Shutdown button shall be a red mushroom type under hinged plastic cover and shall be wired to shutdown all air moving equipment in an emergency.

4.10 FIRE ALARM INTERLOCK

A. Contractor shall interlock with the central fire alarm control panel with wiring to contacts, a controller, and programming. Control points for interface with the fire alarm control panel shall be provided for the following:

Monitor

B. Alarm – An alarm signal from the fire alarm shall shut-down the HVAC

Trouble
Supervision

4.11 ELECTRIC WALL/CEILING/UNIT HEATERS

A. Heaters shall be controlled by internal temperature sensors, interfaced with the building management system.

B. Heaters shall be activated upon room temperature falling below desired setpoint. All heaters except mechanical room unit heater shall be scheduled in accordance with the occupied/unoccupied building schedule.

4.12 VARIABLE REFRIGERANT FLOW HVAC SYSTEM (VRF)

A. BAS shall interface with the VRF system via BACnet. The BACnet interface shall provide the following operable commands:
1. Time of day schedules
2. Individual fan-coil set points
3. Automatic heat/cooling change over
4. Temperature set-point range restriction on individual space controllers
5. System ON/OFF

B. BACnet interface shall receive the followings from the VRF controls:
1. 1. Space temperature
2. 2. Units alarms
3. 3. Mode of operation
4. 4. Filter Change

4.13 FIRE ALARM SHUTDOWN

A. A shutdown panel shall be provided to shutdown all air moving pieces of equipment (expect single phase equipment) upon a phase loss or a signal from fire alarm panel. This shutdown shall not be done through software. The Electrical Division shall provide a relay from the fire alarm panel and from the power monitoring equipment for the controls contractor. Each relay shall be located next to each other and within 20' of the controls contractor Building Control Panel.

4.14 POINTS SUMMARY

A. Rooftop A/C Units Control Points – Space temperature, Space relative humidity if unit is provided with de-humidification cycle, Supply air temperature, Fan control, Cooling stages control, Heating stages control.

B. Split System Heat Pumps - Space temperature, Supply air temperature, Fan control, Cooling stages control, Heating stages control, and outside air temperature for economizer control.

C. Energy Recovery / De-humidification Units: The following points are a minimum the system shall interface with each unit's BACnet controller to meet the required sequence of operation.
   1. Monitored Sensor Value - These points shall provide current/status values.
      a. Outside Air Temp
      b. DX Coil Temp
      c. Discharge/Supply Air Temp
      d. Discharge/Supply Air Humidity
      e. Heat Exchanger Temp
      f. Exhaust Air Temp
      g. Exhaust Air Humidity
      h. Fan Status
      i. Mode of Operation - (Heating, Cooling, Dehumidification, Fan Only)
      j. By-Pass Damper - (Opened / Closed)
   2. Commandable Points – These points shall be fully commandable by the building NATIVE BACnet Control System to allow the factory BACnet Controller to meet the sequence of operation.
      a. Unit Start/Stop
      b. Mode of Operation – (Heating, Cooling, Dehumidification, Fan Only)
      c. Occupied/Unoccupied
      d. Fan Start/Stop – Override Functionality strictly for maintenance capability.
      e. Compressor Start/Stop – Override Functionality strictly for maintenance capability.
      f. Electric Heat Start/Stop – Override Functionality strictly for maintenance capability.

D. Exhaust fans - Fan ON/OFF control, Fan proof

4.15 Additional General Points to monitor and/or control:

Fire alarm status

Generator run status
Transfer switch
Building Power Consumption (KW, KWH, power factor, amperage, line to line voltage all phases, line to neutral voltage all phases, amperage on each phase, real power, apparent power)
Water heater supply water temperature (all water heaters)
Water heater enable/disable control (all water heaters)
Enable/Disable control of all electric or cabinet unit heaters
General space temperature and humidity
Outside air temperature
Outside air humidity
Provide a space sensor to monitor rooms served by ductless split systems.
Freezer/ Cooler monitor temperatures and alarm
Bi-polar ion generator status

4.16 TRAP PRIMER CONTROL

A. Trap primers shall be activated on an operator assignable schedule for an adjustable on time. The EMS controller shall accumulate the total trap primer run times. The initial setting shall be requested from the Owner and programmed before the project is turned over to the Owner. The controls contractor shall provide 24v power for the trap primer units. Coordinate power requirements (AC/DC) with plumbing contractor. Coordinate exact quantity and locations of trap primers with the Plumbing Plans.

4.17 PROJECT START-UP

A. Controls Contractor shall make out start-up cards for all unit and system controllers, as per start up card furnished below, and shall furnish same before Final Completion of project.

B. Final submittal of start-up cards shall be bound in a three-ring binder, collated with unit start-up cards by unit number. Start-up cards shall be in ascending order by unit number with the unit start-up card located before the programming start-up card. Different types of equipment (fan-coil units, rooftop units, etc.) shall be separated with clearly labeled tabs.

CONTROL CONTRACTOR'S PROGRAMMING CHECKLIST
ALL INFORMATION IS TO BE TYPED

School Name

Unit No. EMS Address

Point Editing (w/correct definition (to include unit number and room number), minimum on/off times, alarms limits, heating & cooling limits, etc.)

Critical Alarms

Event Log Setup

Zone Setpoints

Time of Day Schedules

Freeze Protection

Demand Limiting

Duty Cycle

Freezer Equation

Cooler Equation

GRAPHICS:

Remote Point Status Listings

Floor Plan - Location & Label

Equation Flow Charts (if applicable)

END OF SECTION 230900

SECTION 23 11 23

FUEL GAS PIPING

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 SUMMARY

A. This Section includes fuel gas piping within the building and exterior to the building. Products include the following:
   1. Pipe, tube, fittings, and joining materials.
   2. Piping specialties.
   3. Pressure regulators.

B. Related Sections include the following:
   1. Division 2 Section "Natural Gas Distribution" for additional natural gas service piping, specialties, and accessories outside the building.
   2. Division 22 Section “Identification for Plumbing Piping and Equipment” for piping identification.
   3. Division 22 Section “Hangers and Supports for Plumbing Piping and Equipment” for piping inside the building and rooftop pipe supports.

1.3 PROJECT CONDITIONS

A. Gas System Pressures: Two pressure ranges. Primary pressure is 5.0 psig and is reduced to secondary pressure of 0.5 psig or less.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Pressure regulators. Include pressure rating, capacity, and settings of selected models complete with spring color and orifice sizes for each regulator.

B. Welding certificates.

C. Operation and Maintenance Data: For natural gas specialties and accessories to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. NFPA Standard: Comply with NFPA 54, "National Fuel Gas Code."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.7 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

B. New Equipment: If gas fired equipment purchased is not basis of design equipment, the Contractor shall coordinate differences in gas demand and adjust pipe sizing and capacity requirements for gas pressure regulators based on equipment purchased at no cost increase to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Domestic Steel Pipe: ASTM A 53/A 53M; Type E or S; Grade B; black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M.
   1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
   2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
   3. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
   4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
   5. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
   6. Joint Compound and Tape: Suitable for natural gas.
   7. Steel Flanges and Flanged Fittings: ASME B16.5.
   8. Gasket Material: Thickness, material, and type suitable for natural gas.
   9. Press Fittings: Viega Mega Press system.
   10. Acceptable Manufacturers:
      a. Pipe:
         1) Wheatland
         2) Sharon Tube
         3) Allied
      b. Fittings:
         1) Ward
         2) Anvil
         3) Stockham

B. PE Pipe: ASTM D 2513, SDR 11.
   1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.
   2. Transition Fittings: Manufactured pipe fitting with one PE pipe end for heat-fusion connection to PE pipe and with one ASTM A 53/A 53M, Schedule 40, steel pipe end for threaded connection to steel pipe.
   3. Service-Line Risers: Manufactured PE pipe fitting with PE pipe inlet for heat-fusion connection to underground PE pipe; PE pipe riser section with protective-coated, anodeless, steel casing and threaded outlet for threaded connection to aboveground steel piping.
   4. Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.
   5. Acceptable Manufacturers:
      a. Pipe and fittings:
         1) JM Eagle; UAC 2000
         2) Duraline; Polytough1
         3) Endot Industries; PE-2406/2708
         4) Driscoplex 6500 series pipe and fittings.

2.4 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

2.5 PRESSURE REGULATORS

A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.
   1. Manufacturers:
      a. Line Pressure Regulators:
         1) American Meter Company.
         2) Fisher Controls International, Inc.; Division of Emerson.
         3) Sensus.
         4) Maxitrol Company.
         5) Pietro Fiorentini.
   2. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
   3. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
   4. Line Pressure Regulators: ANSI Z21.80 with 2.0 psig inlet pressure rating.

B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping. Install 90 elbow turned down or pipe full size to exterior where called for on plans. Install insect screen in turn down elbow.
   1. Vent piping installed on regulators in exterior locations shall be primed and painted to match piping.
   2. Regulators installed inside the building shall be the ventless type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

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

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Roof mounted gas piping shall be mounted on plastic base, roller cradle, threaded steel rod adjustable pipe stand supports routed a minimum of 6” above the highest point of the roof surface encountered by the pipe run.

C. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in and below building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. 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.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install escutcheons at penetrations of interior walls, ceilings, and floors.
   1. New Piping:
      a. Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
      b. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

M. Verify final equipment locations for roughing-in.

N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying.
   1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2” and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:
   1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
   2. Cut threads full and clean using sharp dies.
   3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
   4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
   5. 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.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Heat-fusion Weld Joints: Install as per manufacturers' installation instructions.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1" and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4": Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2" and NPS 2": Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2" to NPS 3-1/2": Maximum span, 10 feet; minimum rod size, 1/2 inch.

3.8 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping identification.

B. Install tracer wire at gas pipe stub ups from below grade accessible and tied off to pipe above grade.

3.10 PAINTING

A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components, with factory-applied paint or protective coating.
   1. Alkyd System: MPI EXT 5.1D.
      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
      c. Topcoat: Exterior alkyd enamel (flat).
      d. Color: Gray.

C. Paint exposed, interior metal piping, valves, and piping specialties, except components, with factory-applied paint or protective coating.
   1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Interior latex matching topcoat.
      c. Topcoat: Interior latex (flat).
      d. Color: Gray.
   2. Alkyd System: MPI INT 5.1E.
      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Interior alkyd matching topcoat.
      c. Topcoat: Interior alkyd (flat).
      d. Color: Gray.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain electronically activated valves.

3.13 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:
1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

B. Underground Piping:
1. PE pipe, PE fittings, and heat-fusion joints.
2. Underground-to-Aboveground Piping Connections: Service-line riser.
3. PE-to-Steel Piping Connections: Transition fitting.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 1-1/2” and smaller shall be the following:
1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:
1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.15 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

A. Aboveground, branch piping NPS 1-1/2” and smaller shall be the following:
1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:
1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

3.16 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe sizes NPS 2” and smaller shall be one of the following as called for on plans:
1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2-1/2” and larger shall be the following:
1. Bronze plug valve.

C. Valves in branch piping for single appliance shall be the following:
1. Two-piece, full-port, bronze ball valves with bronze trim.

3.17 EXAMINATION

A. Examine roughing-in for gas piping system to verify actual locations of piping connections before equipment installation.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.18 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.19 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping from the meter assembly and connect to fuel gas distribution for service to building.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Dielectric fittings are specified in Division 22 Section "Common Work Results for Plumbing."

3.20 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 5 psig or less:
1. Above ground piping 2-1/2" and smaller: Schedule 40 black steel pipe with malleable-iron threaded fittings.
2. Above ground piping 3" and larger: Schedule 40 black steel pipe with schedule 40 butt weld fittings.
3. Underground Piping: PE pipe, PE fittings, and heat-fusion joints.

3.21 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 to 5 psig: Gas cock or plug cock as called for on plans.

B. Piping Line Valves, NPS 2 and Smaller: Gas cock or plug cock as called for on plans.

C. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve.

3.22 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums.

2. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls perpendicular to penetrated walls.
   a. Exception: Tubing passing through partitions or walls.
3. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
   a. Exception: Accessible above-ceiling space specified above.

B. Drips and Sediment Traps: Install drips at points where condensate or debris may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
   1. Construct drips and sediment traps using threaded tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

C. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

D. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

E. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down. Concentric reducers may be used in vertical and at unit connections.

F. Connect branch piping from top or side of horizontal piping.

G. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

H. Install strainer on inlet of line pressure regulator to emergency gas generator unit.

I. Install pressure gauge test port upstream and downstream from each line pressure regulator.

J. Install flanges on valves, specialties, and equipment having NPS 3 and larger connections.

K. Install vent piping for gas pressure regulators and gas trains where called for on plans, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screen in large end.

L. Install identification tag or stencil at each gas pressure regulator to match schedule on Contract Documents.

M. Install underground, natural gas distribution piping buried at least 30 inches below finished grade.

N. Install underground, PE, natural gas distribution piping according to ASTM D 2774.

O. Install continuous # 12 copper tracer wire attached to the crown of buried exterior gas piping with plastic tie straps at maximum 6 foot spacing and within 18 inches of each change of direction. Tracer wire shall extend 6” above finished grade with one complete wrap around pipe.

P. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape 12 inches over the top of natural gas distribution piping during backfilling of trenches for piping.

Q. Exterior steel gas piping and fittings shall be prime painted at the time of installation. Final painting shall be performed after the system is tested for leaks and prior to system to being placed in service.

R. Install piping identification on all piping inside the building above ceilings.

3.23 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Division 22 Section "Common Work Results for Plumbing.”

B. Use materials suitable for fuel gas.

C. Underground-to-Aboveground Piping Connections: Service-line riser.

D. PE-to-Steel Piping Connections: Transition fitting.

3.24 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

3.25 PIPING IDENTIFICATION

A. All gas piping inside the building shall be identified with pipe identification labels as specified in Division 22 Section “Identification for Plumbing Piping and Equipment".
   1. Where piping is to be primed and painted, pipe identification shall be applied after the painting is completed.

3.26 PAINTING

A. Use materials and procedures in Division 9 painting Sections.

B. Priming of piping and fittings shall be performed at the time of installation. Final painting shall be done after the system has been tested and is free of leaks and prior to being placed in service.

C. Paint exterior service meters, pressure regulators, and specialty valves.
1. Color: Gray.

3.27 FIELD QUALITY CONTROL

A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.

B. The Architect shall be given 48 hours notice for all scheduled inspections and testing for gas piping system installations.

C. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

END OF SECTION 23 11 23

SECTION 232113
HYDRONIC PIPING

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 pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
   1. Condensate-drain piping.

B. Related Sections include the following:

   1. Division 15 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
   1. Hot-Water Heating Piping: 150 psig at [200 deg F.
   2. Condenser\Tower-Water Piping: 150 psig 200 deg F.
   3. Makeup-Water Piping: 125 psig at 150 deg F.
   4. Condensate-Drain Piping: 150 deg F.
   5. Blowdown-Drain Piping: 200 deg F.
   6. Air-Vent Piping: 200 deg F.
   7. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.4 SUBMITTALS

A. Product Data: For each type of the following: Pressure-seal fittings.
   1. Piping cut sheet

B. Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Welding certificates.

D. Qualification Data: For Installer.

E. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.
1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
a. Anvil International, Inc.
b. S. P. Fittings; a division of Star Pipe Products.
c. Mueller Brass

C. Wrought-Copper Unions: ASME B16.22.

2.2 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 thickness or specific material is indicated.
a. 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.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Company, Inc.
2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Condensate-Drain Piping: Type M, 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. 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. 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 tee fittings in main pipe, with the branch connected to the side the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. All piping shall be adequately supported and guided in accordance with Section 230529.

Q. All piping specialties shown on drawings or specified herein shall be incorporated into the piping systems and located to provide adequate service clearance.

R. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

S. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

T. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

U. Identify piping as specified in Section 230553.

3.3 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 230553. 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 steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 1 or less : Maximum span, 6 feet ; minimum rod size, 3/8 inch .
   2. NPS 2 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .
   3. NPS 3 & 4 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .
   4. NPS 6 : Maximum span, 8 feet ; minimum rod size, 3/4inch .

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, 3/8 inch .
   2. NPS 1 : Maximum span, 6 feet ; minimum rod size, 3/8 inch .
   3. NPS 1-1/2 : Maximum span, 6 feet ; minimum rod size, 3/8 inch .
   4. NPS 2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
   5. NPS 2-1/2 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .
   6. NPS 3 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .

3.4 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. 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.

E. 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.

F. 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.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be as shown on plans.

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 according to Division 15 Section "Meters and Gages."

3.6 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.

END OF SECTION 232113

SECTION 232300
REFRIGERANT 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 refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig .
   2. Suction Lines for Heat-Pump Applications: 535 psig .
   3. Hot-Gas and Liquid Lines: 535 psig .

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
   1. Thermostatic expansion valves.
   2. Solenoid valves.
   3. Pressure-regulating valves.

B. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type L or ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

2.2 VALVES AND SPECIALTIES

A. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig .
8. Working Pressure Rating: 500 psig .
9. Maximum Operating Temperature: 275 deg F .

B. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig .

C. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24, 115, or 208-V ac coil.
6. Working Pressure Rating: 400 psig .
7. Maximum Operating Temperature: 240 deg F .
8. Manual operator.

D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.

4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig .
6. Maximum Operating Temperature: 240 deg F .

E. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 450 psig.

F. Moisture/Liquid Indicators:
1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig .
7. Maximum Operating Temperature: 240 deg F .

G. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig .
4. Maximum Operating Temperature: 275 deg F .

H. Liquid Accumulators: Comply with ARI 495.
1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig .
4. Maximum Operating Temperature: 275 deg F .

2.3 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

C. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

D. Install thermostatic expansion valves as close as possible to distributors on evaporators.
   1. Install valve so diaphragm case is warmer than bulb.
   2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
   3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

E. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

F. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

3.3 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 to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. 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.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.
   3. Install traps and double risers to entrain oil in vertical runs.
   4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

W. Insulate refrigerant suction lines for all direct expansion split systems. Insulate additional lines as directed by manufacturer for all non-ducted and variable refrigerant flow systems.

3.4 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. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 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. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 1/2 : Maximum span, 60 inches ; minimum rod size, 1/4 inch .
2. NPS 5/8 : Maximum span, 60 inches ; minimum rod size, 1/4 inch .
3. NPS 1 : Maximum span, 72 inches ; minimum rod size, 1/4 inch .
4. NPS 1-1/4 : Maximum span, 96 inches ; minimum rod size, 3/8 inch .
5. NPS 1-1/2 : Maximum span, 96 inches ; minimum rod size, 3/8 inch .
6. NPS 2 : Maximum span, 96 inches ; minimum rod size, 3/8 inch .
7. NPS 2-1/2 : Maximum span, 108 inches ; minimum rod size, 3/8 inch .

8. NPS 3 : Maximum span, 10 feet ; minimum rod size, 3/8 inch .
9. NPS 4 : Maximum span, 12 feet ; minimum rod size, 1/2 inch .

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 2 : Maximum span, 10 feet ; minimum rod size, 3/8 inch .
2. NPS 2-1/2 : Maximum span, 11 feet ; minimum rod size, 3/8 inch .
3. NPS 3 : Maximum span, 12 feet ; minimum rod size, 3/8 inch .
4. NPS 4 : Maximum span, 14 feet ; minimum rod size, 1/2 inch .

E. Support multi-floor vertical runs at least at each floor.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers . If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig .
4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 23 3113
DUCTWORK

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. Double-wall round ducts and fittings.
4. Sheet metal materials.
5. Duct liner.
6. Sealants and gaskets.
7. Hangers and supports.
8. Exterior ducts and fittings.
9. Fabric Duct System

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. 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".

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Sheet metal including gauges
4. Spiral Ductwork including fittings

5. Rectangular Ductwork including fittings
6. Fabric Ductwork
7. Support Systems

B. Operation and Maintenance Data: For fabric duct to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

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 1-4, "Transverse (Girth) 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 1-5, "Longitudinal Seams - Rectangular Ducts," 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 2, "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.

1. Manufacturers: Subject to compliance with requirements:

a. Lindab Inc.
b. McGill AirFlow LLC.
c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.
f. Impulse Air

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," 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 3-1, "Seams - Round Duct and Fittings," 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. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "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 DOUBLE-WALL ROUND DUCTS AND FITTINGS (All exposed areas unless noted otherwise)

A. Manufacturers: Subject to compliance with requirements:

1. Lindab Inc.
2. McGill AirFlow LLC.
3. SEMCO Incorporated.
4. Sheet Metal Connectors, Inc.
5. Silver Sheet Enterprises
6. Impulse Are

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," 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. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," 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."
3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "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."

C. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
2. Coat insulation with antimicrobial coating.
3. Cover insulation with polyester film complying with UL 181, Class 1.

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections. Minimum gauge of sheet metal shall be as specified below:

GREATEST DIMENSION	MIN. U. S. GAUGE
0" - 12"	26
13" - 30”	24
31" - 54"	22
55" - 84"	20
85" and above	18
Plenum	22

Gauges above are minimum thickness of metal and exceed SMACNA standards in many cases.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. 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.

2.5 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: Subject to compliance with requirements:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Performance

1) Building Interior: Type I, Flexible: R-6, 1.5” thick, 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2) Building Exterior: Type I, Flexible: R-8, 2” thick

3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

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- or 0.135-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 2-19, "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.

2.6 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. 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.

C. 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.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 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.

2.7 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 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "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.

2.8 FABRIC DUCT SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products manufactured in the United States, choose one of the following: Ductsox, Prihoda Fabric, Uni-Fab, Fabric-Air, or KE Fibertec.

B. Air diffusers shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:

1. Fabric Construction: 100% Flame Retardant and treated with a machine wash-able anti-microbial agent from the manufacturer.
2. Weight: 5.2 oz. / sq. yd. per ASTM D3776
3. Color: Standard: Coordinate with Architect
4. Air Permeability: 2 (+2/-1) cfm/ft2 per ASTM D737, Frazier
5. Temperature Range: 0 degrees F to 180 degrees F
6. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the flame spread/smoke developed requirements of NFPA 90-A and ICC AC167.
7. Antimicrobial agent shall be proven 99% effective after 10 laundry cycles per AATCC Test Method 100.

C. System Fabrication Requirements:
1. Air dispersion accomplished by linear vent and permeable fabric. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface.
2. Size of vent openings and location of linear vents to be specified and approved by manufacturer to provide even air distribution throughout the occupied space. Air distribution system shall provide minimum 10 fpm air flow to within 2’ of floor and 2’ of exterior wall.
3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via. zip screw fastener - supplied by contractor.
4. Inlet connection includes zipper for easy removal / maintenance.
5. Lengths to include required zippers as specified by manufacturer.
6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 - 0.50 in w.g. static pressure.
7. End cap includes zipper for easy maintenance.
8. Fabric system shall include connectors to accommodate suspension system listed below.
9. Fabric duct shall be supported by internal frame system so that duct will maintain inflated shape the entire length of duct run.

D. Design Parameters:
1. Fabric diffusers shall be designed from 0.25” water gage minimum to 3.0” maximum, with 0.5” as the standard.
2. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
3. Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.

E. Suspension Hardware: (include applicable components only)
1. Suspended U-Track: System shall be installed using a tension cable system including a single (1 Row) run of aluminum U-Track. Single (1 Row) located 1-1/2” above top-dead-center.
2. Row supports are required for systems of 32” diameter and larger. Hardware to include 8' sections of track, splice connectors, track endcaps, and vertical cable support kits - consisting of a length of cable with a locking stud end and Gripple quick cable connectors. Radius aluminum track must be included for all horizontal/flat radius sections.
3. Provide with internal full circumference hold open reinforcing aluminum rings. Rings shall be a minimum of every 3 feet. Internal tensioning system shall be provided to re

duce startup pop. The internal tensioning rings shall be provided every 30 feet and at the end cap. System shall be installed per manufacturers requirements.

2.9 KITCHEN HOOD EXHAUST DUCT

1. Refer to specification section 23 38 13 Commercial Kitchen Hoods for ductwork requirements.

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. Ductwork, unless noted otherwise, shall be constructed for a positive pressure of 3" W.C. for supply ductwork and a negative pressure of 1.5" W.C. for exhaust and return ductwork. Ductwork reinforcement shall be provided as required by the SMACNA HVAC Duct Construction Standards - Metal & Flexible - Third Edition - 2005 for the pressure class and minimum gauges listed above. **Contractor shall submit a schedule indicating duct gauge and reinforcement methods to be utilized for each duct dimension range outlined above prior to fabricating any ductwork. Minimum metal thickness is listed in Para 2.4A above.** 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 in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

M. Sizes of duct indicated as lined shall be adjusted to accommodate liner thickness maintaining interior dimensions.

3.2 SEAM AND JOINT SEALING

A. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

1. For static-pressure classes 3 inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class B.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "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 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "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 complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 TURNING VANES

A. Rectangular supply and return ductwork elbows shall be provided with turning vanes.

B. Spiral and rectangular supply ductwork tees shall be provided with turning vanes.

3.6 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. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as follows:

1. Dishwasher Hood Exhaust Ducts:

    a. Type 304, stainless-steel sheet.
    b. Exposed to View: No. 4 finish.
    c. Concealed: No. 2D finish.
    d. Welded seams and joints.

2. Fume Hood Exhaust Ducts:

    a. Type 304, stainless-steel sheet.
    b. Exposed to View: No. 4 finish.
    c. Concealed: No. 2D finish.
    d. Welded seams and joints.

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Stainless-Steel Ducts: Galvanized steel.

C. Liner:

1. Supply- and Return-Air Ducts: Fibrous glass, Type I, 1.5 inch thick.
2. Transfer Ducts: Fibrous glass, Type I, 1.5 inch thick.

D. Double-Wall Duct Interstitial Insulation:

1. Supply- and Return-Air Ducts, 16 Inches and Smaller in Diameter or Rectangular Equivalent: 1.5 inch thick.
2. Supply- and Return-Air Ducts, 18 Inches and Larger in Diameter or Rectangular Equivalent: 1.5 inch thick.

E. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

F. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 23 3300
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. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Ceiling dampers.
7. Smoke dampers.
8. Combination fire and smoke dampers.
9. Turning vanes.
10. Duct-mounted access doors.
11. Flexible connectors.
12. Flexible ducts.
13. Spin-ins.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
2. Backdraft and pressure relief dampers.
3. Barometric relief dampers.
4. Manual volume dampers.
5. Control dampers.
6. Fire dampers.
7. Ceiling dampers.
8. Smoke dampers.
9. Combination fire and smoke dampers.
10. Turning vanes.
11. Duct-mounted access doors.
12. Flexible connectors.
13. Flexible ducts.

14. Spin-ins.

B. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

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 AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 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. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. 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.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.

4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: 0.052-inch-thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Aluminum or Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Sleeve: Minimum 20-gage thickness.

2.3 BAROMETRIC RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.

8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: 0.064-inch-thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades:

1. Multiple, 0.025-inch-thick, roll-formed aluminum.
2. Maximum Width: 6 inches.
3. Action: Parallel.
4. Balance: Gravity.
5. Eccentrically pivoted.

G. Blade Seals: Neoprene.

H. Blade Axles: Galvanized steel.

I. Tie Bars and Brackets:

1. Material: Aluminum or Galvanized steel.
2. Rattle free with 90-degree stop.

J. Return Spring: Adjustable tension.

K. Bearings: Synthetic.

L. Accessories:

1. Adjustment device to permit setting for varying differential static pressures.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. METALAIRE, Inc.

f. Nailor Industries Inc.
g. Pottorff; a division of PCI Industries, Inc.
h. Ruskin Company.
i. Trox USA Inc.
j. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze or 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.

8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 1-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.

D. Spin-in fittings:

1. Spin-in fittings shall be used for round take-offs from rectangular duct mains. Spin-ins shall include a scoop extractor and balancing damper with 2" stand-off bracket with locking quadrant and continuous square shaft with end bearings. Scoop shall be located

so the balancing handle is located on the sides. The balancing damper handle shall not be located on the top of the spin during installation. See plan details.

E. Use of “Dove-Tail” fittings or connections is prohibited.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. Lloyd Industries, Inc.
8. M&I Air Systems Engineering; Division of M&I Heat Transfer Products Ltd.
9. McGill AirFlow LLC.
10. METALAIRE, Inc.
11. Metal Form Manufacturing, Inc.
12. Nailor Industries Inc.
13. NCA Manufacturing, Inc.
14. Ruskin Company.
15. Vent Products Company, Inc.
16. Young Regulator Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch thick.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 8 inches.
2. Parallel- and opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Oil-impregnated bronze or Molded synthetic.
2. 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.
3. Thrust bearings at each end of every blade.

2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. PHL, Inc.
10. Pottorff; a division of PCI Industries, Inc.
11. Prefco; Perfect Air Control, Inc.
12. Ruskin Company.
13. Vent Products Company, Inc.
14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.7 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.

C. Smoke Detector: Integral, factory wired for single-point connection.

D. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel, with overlapping gusseted or mechanically attached corners and mounting flange.

E. Blades: Roll-formed, horizontal, interlocking, 0.063-inch thick, galvanized sheet steel.

F. Leakage: Class II

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.05-inch thick, galvanized sheet steel; length to suit wall or floor application.

I. Damper Motors: two-position action.

J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "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 23 09 00 " INSTRUMENTATION AND CONTROL 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 and breakaway torque rating of 150 in. x lbf.
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.
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.

7. Electrical Connection: 115 V, single phase, 60 Hz**.**

K. Accessories:

1. Auxiliary switches for signaling and fan control.
2. Momentary test switch, Test and reset switches

2.8 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. 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 static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel, with overlapping gusseted or mechanically attached corners and mounting flange.

F. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

G. Smoke Detector: Integral, factory wired for single-point connection.

H. Blades: Roll-formed, horizontal, interlocking, 0.063-inch thick, galvanized sheet steel.

I. Leakage: Class II

J. Rated pressure and velocity to exceed design airflow conditions.

K. Mounting Sleeve: Factory-installed, 0.05-inch thick, galvanized sheet steel; length to suit wall or floor application.

L. Master control panel for use in dynamic smoke-management systems.

M. Damper Motors: two-position action.

N. 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 23 09 00 "INSTRUMENTATION AND CONTROL 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 and breakaway torque rating of 150 in. x lbf.
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.

2.9 CEILING DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. McGill AirFlow LLC.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. Prefco; Perfect Air Control, Inc.
7. Ruskin Company.
8. Vent Products Company, Inc.
9. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

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 rated, fusible links.

F. Fire Rating: 2 hours.

2.10 TURNING VANES

A. Manufacturers: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.

3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. 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.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.11 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - 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: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.

d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.12 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.13 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 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.

E. 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.

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.

2.14 FLEXIBLE DUCTS

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. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Thermaflex
4. Atco

B. Insulated, Flexible Duct: UL 181, Class 1, CPE film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action for sizes 3 through 18 inches, to suit duct size. Nylon cable straps are not acceptable for securing flexible duct.

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 backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

C. 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.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire and smoke dampers according to UL listing.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Downstream from manual volume dampers, control dampers, turning vanes, 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. Upstream of turning vanes.
6. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.

J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Connect variable volume and powered induction terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to low-pressure ducts directly or with maximum 72” lengths of flexible duct. Flexible ducts shall be supports at 36” intervals. Supports shall be attached to the structure and shall not crimp or impede proper airflow though the installed ductwork.

O. Connect flexible ducts to metal ducts with stainless steel draw bands.

P. Rectangular supply and return ductwork elbows shall be provided with turning vanes.

Q. Spiral and rectangular supply ductwork tees shall be provided with turning vanes.

R. 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.

END OF SECTION 233300

SECTION 23 3423
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. This Section includes the following:
1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.
3. In-line centrifugal fans.
4. Fume Hood fans.
5. Kiln ventilation system.
6. Air curtain.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on 1,000-foot elevation.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and 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.

B. Operation and Maintenance Data: For power ventilators 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. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acme Engineering & Mfg. Corp.
2. Aerovent; a Twin City Fan Company
3. Broan Mfg. Co., Inc.
4. Greenheck.
5. Loren Cook Company.
6. Penn Ventilation.
7. Twin City Fans

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
1. Up-blast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base. Refer to Division 07 for additional requirements.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 16 inches or greater per roofing bond requirements.

2.2 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acme Engineering & Mfg. Corp.
2. Aerovent; a Twin City Fan Company
3. Broan Mfg. Co., Inc.
4. Greenheck.
5. Loren Cook Company.
6. Penn Ventilation.
7. Twin City Fans

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille designs other than those specified in first paragraph below are available.

E. Grille: Plastic grilles for fans from 50 to 200 cfm and painted aluminum grilles for fans greater than 200 cfm, louvered grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link. (As indicated on plans.)
3. Isolation: Rubber-in-shear vibration isolators.

2.3 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acme Engineering & Mfg. Corp.
   2. Aerovent; a Twin City Fan Company
   3. Broan Mfg. Co., Inc.
   4. Greenheck.
   5. Loren Cook Company.
   6. Penn Ventilation.
   7. Twin City Fans

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
   3. Companion Flanges: For inlet and outlet duct connections.
   4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
   5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.4 FUME HOOD FAN

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Greenheck.
   2. Strobic-Aire.
   3. Loren Cook Company.
   4. Penn Ventilation.
   5. Twin City Fans

B. The fume hood fan shall be an up-blast fan with a bypass-plenum to provide variable volume flow and to dilute noxious fumes. The discharge fan nozzle shall be designed to expel the fumes at an increased plume height.

C. Housing: Fan housing shall be constructed of welded steel. All fan parts shall be coated with a corrosion resistant resin. Conical discharge nozzle shall be designed to handle velocities up to 6000 feet per minute efficiently. Discharge stack-caps or hinged stack are not permitted. Housing shall have a drain and access panel.

D. Fan impeller shall be centrifugal type, backward inclined or forward-curved, statically and dynamically balanced. Impeller shall be constructed of aluminum, fully welded, and coated with a corrosion resistant. Fan shaft shall be 316 stainless steel. Belt drives and sheaves shall be sized for 150% of the motor horsepower. Bearings not permanently sealed and lubricated shall have extended grease fittings. Bearings shall be fixed to the fan shaft using concentric mounting locking collars. Bearings shall be designed for a L-10 life of no less than 100,000 hours.

E. Fan shall be variable volume by providing a system of bypass dampers or a variable speed drive with a direct drive motor. Fan variable volume range shall be 25% - 100% of scheduled airflow. Fan shall include a bypass air plenum. The bypass air plenum shall be constructed of fully welded galvanized steel and coated with a corrosion resistant resin. The plenum shall include bypass air damper, fan isolation damper, intake air hood and birdscreen. Bypass damper shall be opposed-blade type and constructed of aluminum. The fan isolation damper shall be constructed of aluminum and coated with a corrosion resistant resin. Fan isolation damper shall fail closed.

F. Motor and drive shall be mounted on vibration isolators and have motor thermal overload protection.

G. ROOF MOUNTING CURBS
   1. Curbs shall be a minimum 16 gauge and meet the requirements of division 07 Roof Accessories.

H. Fan shall be installed per manufacturer’s requirements.

2.5 KILN VENTILATION SYSTEM

A. Hood shall be semi-portable type including suspended hood, venting hose, and overhead pulley system, and swinging wall bracket assembly.

B. Hood shall be constructed of spun aluminum alloy. Hood diameter shall be a minimum of 54" diameter.

C. Venting hose shall include aluminum inner and outer surfaces. Unit shall include control switch and plug, venting kit including all necessary clamps. Overhead bracket shall be constructed of 1" square tubing including necessary suspension wire, clips, and steel counterweight.

D. System shall include a spun aluminum hood, overhead counterweight pulley system, wall brackets, 10' of 6" flexible hose, and mounting plates and accessory hardware.

2.6 AIR-CURTAIN UNIT

A. Manufacturers: Subject to compliance with requirements:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   1. Berner International.
   2. Cambridge Engineering, Inc.
   3. Mars Air Products; Dynaforce Division.

4. Mars Air Products; Mars Air Door Division.

C. Housing:
1. Materials: Galvanized steel with electrostatically-applied epoxy-enamel finish over powdered mirror.
a. Materials: One-piece, molded, high-impact, white polymer material.
b. Materials: Heavy-gage, electroplated-zinc steel with welded construction and polyester-coated finish.
c. Materials: Heavy-gage, aluminum construction.

D. Anodized Finish: Match finish and color of adjacent architectural metals. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

E. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
1. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker).

F. Materials: Stainless steel.
1. Discharge Nozzle: Integral part of the housing, containing fixed air-directional vanes.
2. Discharge Nozzle: Integral part of the housing, containing adjustable air-directional vanes with 40-degree sweep front to back.
3. Discharge Nozzle: Integral part of the housing, containing air-directional vanes adjustable in 5-degree increments through a 45-degree sweep front to back.

G. Mounting Brackets: Steel, for wall mounting.

H. Air-Intake Louvers: Comply with requirements in Section 089000 "Louvers and Vents."

I. Air-Intake Louvers:

J. Louvers: Integral part of and same material as the housing, mechanically field adjustable and capable of reducing air-outlet velocity by 60 percent with louver in totally closed position.
1. Grille: Integral part of and same material as the housing.
2. Insect Screen: Stainless steel, removable.

K. Fans:
1. Centrifugal, forward curved, double width, double inlet.
a. Painted steel.
b. Statically and dynamically balanced.
c. Direct drive.

L. Motors: 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."

M. 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.
1. Multispeed.
2. Resiliently mounted.
3. Continuous duty.
4. Totally enclosed, air over.
5. Integral thermal-overload protection.
6. Bearings: Permanently sealed, lifetime, prelubricated, ball bearings.
7. Disconnect: Internal power cord with plug and receptacle.

N. Controls:
1. Automatic Door Switch: Combination roller-plunger type concealed in the door frame to activate air curtain when door opens and to deactivate air curtain when door closes.
2. Three-Speed Switch: Manually activates, deactivates, and controls air-curtain fan speed.
3. Motor-Control Panel: Complete with motor starter, 115-V ac transformer with primary and secondary fuses, terminal strip, and NEMA 250, enclosure.
4.

2.7 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

2.8 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with 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. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

3.4 WARRANTIES

A. Fans shall be provided with 1 year warranty from substantial completion.

END OF SECTION 23 3423

SECTION 233713
DIFFUSERS, REGISTER, AND GRILLES

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. Louver face diffusers.
   3. Adjustable bar registers and grilles.
   4. Fixed face registers and grilles.

B. Related Sections:
   1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 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.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
   1. Revise subparagraphs below to suit Project.
   2. Ceiling suspension assembly members.
   3. Method of attaching hangers to building structure.
   4. Size and location of initial access modules for acoustical tile.
   5. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   6. Duct access panels.

C. The reflected ceiling plan shall be referenced to determine air device frame types. Air devices located in gypsum board ceilings shall be installed with steel surface mount adaptor frame.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Krueger.
   b. METALAIRE, Inc.
   c. Nailor Industries Inc.
   d. Price Industries.
   e. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel or Aluminum.
4. Finish: Baked enamel, white.
5. Face Size: Per schedule and ceiling type.
6. Mounting: Per schedule and ceiling type.
7. Pattern: Fixed.
8. Dampers: Radial opposed blade.
9. Accessories:
   a. Insulated backing covering entire surface of top of diffuser
   b. Equalizing grid.
   c. Plaster ring.
   d. Safety chain.
   e. Wire guard.
   f. Sectorizing baffles.
   g. Operating rod extension.

B. Louver Face Diffuser:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Krueger.
   b. METALAIRE, Inc.
   c. Nailor Industries Inc.
   d. Price Industries.
   e. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Steel or Aluminum.
4. Finish: Baked enamel, white.
5. Face Size: Per schedule and ceiling type.
6. Mounting: Per schedule and ceiling type.
7. Pattern: Four-way, unless noted otherwise.
8. Dampers: Radial opposed blade.
9. Accessories:
   a. Insulated backing covering entire surface of top of diffuser
   b. Square to round neck adaptor.
   c. Adjustable pattern vanes.
   d. Throw reducing vanes.
   e. Equalizing grid.
   f. Plaster ring.
   g. Safety chain.
   h. Wire guard.
   i. Sectorizing baffles.
   j. Operating rod extension.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Krueger.
      b. METALAIRE, Inc.
      c. Nailor Industries Inc.
      d. Price Industries.
      e. Titus.
   2. Material: Steel or Aluminum.
   3. Finish: Baked enamel, white.
   4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
   5. Core Construction: Integral.
   6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
   7. Frame: 1-1/4 inches wide.
   8. Mounting Frame: Per schedule and ceiling type.
   9. Mounting: Per schedule and ceiling type.
   10. Damper Type: Adjustable opposed blade.

B. Adjustable Bar Grille:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Krueger.
      b. METALAIRE, Inc.
      c. Nailor Industries Inc.
      d. Price Industries.
      e. Titus.
   2. Material: Steel or Aluminum.
   3. Finish: Baked enamel, white.
   4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
   5. Core Construction: Integral.
   6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
   7. Frame: 1-1/4 inches wide.
   8. Mounting Frame: Per schedule and ceiling type.
   9. Mounting: Per schedule and ceiling type.

C. Fixed Face Register:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Krueger.
      b. Nailor Industries Inc.
      c. Price Industries.
      d. Titus.
   2. Material: Steel or Aluminum.
   3. Finish: Baked enamel, white.
   4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
   5. Core Construction: Integral.
   6. Frame: 1-1/4 inches wide.
   7. Mounting Frame: Per schedule and ceiling type.
   8. Mounting: Per schedule and ceiling type.
   9. Damper Type: Adjustable opposed blade.

D. Fixed Face Grille:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Krueger.
      b. Nailor Industries Inc.
      c. Price Industries.
      d. Titus.
   2. Material: Steel or Aluminum.
   3. Finish: Baked enamel, white.
   4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
   5. Core Construction: Integral.
   6. Frame: 1-1/4 inches wide.
   7. Mounting Frame: Per schedule and ceiling type.
   8. Mounting: Per schedule and ceiling type.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

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. Locate ceiling mounted supply air diffusers a minimum of 24” from light fixtures.

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 233713

SECTION 234100

PARTICULATE AIR FILTRATION

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 factory-fabricated air-filter devices and media used to remove particulate matter from air for HVAC applications.

B. Owner retains a filter changing service. Contractor is responsible for permanent filter racks under this contract.

C. The General Contractor shall be responsible for contacting the. Note: No HVAC equipment shall be operated without the filter installed.

1.3 SUBMITTALS

A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.

B. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air filters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Comply with ARI 850.

C. Comply with ASHRAE 52.1 and ASHRAE 52.2 for method of testing and rating air-filter units.

D. Comply with NFPA 90A and NFPA 90B.

PART 2 - PRODUCTS

2.1 REPLACEABLE MEDIA PANEL FILTERS

A. Description: Factory-fabricated, replaceable media filters with holding frames.

B. Media: Fibrous material with anti-microbial agent and held in place by self-supporting wire grid of the frame below. Minimum rating MERV-8.

C. Media-Grid Frame: Steel frames with hardware cloth grid in accordance with Owner's filter service standards.

D. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners, and suitable for bolting together into built-up filter banks.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The contractor shall maintain filters during construction as noted in this section. The filters shall be replaced monthly or sooner depending on jobsite conditions and the amount of airborne debris. The Owner or engineer can require the filters to be replaced more often depending on jobsite conditions. The contractor shall replace the filters monthly throughout the one-year warranty period.

B. Install filter frames according to manufacturer's written instructions.

C. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

D. Install filters in position to prevent passage of unfiltered air.

E. Coordinate filter installations with duct and air-handling unit installations.

3.2 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 234100

SECTION 23 4310
BI-POLAR IONIZATION UNITS

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 describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit, including, but not limited to fan-coils and other air handling equipment as shown on the plans, details or equipment schedules.

1.3 RELATED WORK

A. Testing, balancing and inspection services

B. Facility Access and Protection

C. Duct work

D. Electrical Wiring

E. Control Wiring

1.4 SUBMITTALS

A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.

B. Third party verified test data showing that the system submitted complies with ASHRAE Standard 62.1-2010 requirements for the indoor air quality procedure. Also, computer selections of each application where the equipment is used (Classrooms, Offices, Cafeterias, etc.) shall be submitted.

C. Product performance data for filters, gauges and housings.

D. Product drawings detailing all physical, electrical, ductwork and control requirements.

E. Manufacturer's Follow-up Service Program details.

1.5 REFERENCE TO CODES AND STANDARDS

A. ASHRAE Standards 62 & 52

B. UL Standard 867

C. CFR 39-75 Title 21 April 17, 1974

D. National Electric Code NFPA 70, 1990

1.6 QUALITY ASSURANCE

A. The Air Purification System shall be a product of an established manufacturer with installations in successful operation in the USA. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered.

B. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.

C. The complete air purification system including the bi-polar ionization unit and remote monitor as assembled, complete with power and control wiring, safety switches, airflow switches and controls shall be listed by either UL or Intertek/ETL for conformance to UL 867-2007.

D. Provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.2- 2007 to validate acceptable indoor air quality at the quantity of outside air scheduled.

1.7 WARRANTY

A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve months after shipment or eighteen months for Owner acceptance, whichever occurs first.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver in factory fabricated shipping containers. Identify on outside of container the type of product and location where it is to be installed. Do not crush or bent product or container.

B. Store in original cartons and protect from weather and construction work traffic.

C. Store indoors and in accordance with the manufacturer’s recommendations for storage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Equals are, as follows below, provided they meet all requirements of this specification. The contractor shall be responsible for any additional costs associated with substitution from the basis of design. All other alternate manufacturers submitted for substitution must provide their ASHRAE 62.1-2010 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant and an independent validation study has been performed to validate the accuracy of the ASHRAE modeling software. Subject to compliance with requirements, provide products by one of the following manufacturers:
   1. Plasma-Air
   2. Atmos Air
   3. Global Plasma Solutions

2.2 DESCRIPTION

A. Each piece of air handling equipment, so designated on the plans, details and/or equipment schedules shall contain a bi-polar ionization or plasma generator with bi-polar ionization system capable of:
   1. Effectively killing microorganisms throughout cooling coil, drain pan and supply duct (mold, bacteria, virus, etc.).
   2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
   3. Capable of reducing static space charges.

B. Air Exchange Rate
   1. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.

C. Velocity Profile
   1. The air velocity through the plenum approaching the air purification system shall not exceed 1,000 fpm (5 m/s) in the bi-polar ionization section.

D. Humidity
   1. Ion tubes and pinpoint electrodes shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 99% shall not cause damage, deterioration or dangerous conditions within the air purification system.

2.3 EQUIPMENT REQUIREMENTS

A. Electrode Specifications
   1. Each bi-polar ionization unit shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Electrodes shall be installed in pairs to create the required dielectric. Electrodes that may corrode are not acceptable.

2. Electrical power to the electrodes shall be interrupted when the airflow is less than 100 fpm or when access doors to the electrode plenum section are opened.

B. Duct, Unit Casing, or Plenum Mounted Units
1. Where so indicated on the plans and/or schedules, duct mounted ionization filtration unit(s) shall be supplied and installed. The generator shall be installed in a convenient location above the ceiling for visual indication of power, removal and servicing. Filtration on any equipment requiring bi-polar ionization shall be MERV 6 or better.
a. Ion generators shall have ionization status indication lights, fuse with fuse holder, external alarm connector and test jack on the bottom or side; visible on the exterior of the duct or unit. The units shall be supplied with a permanent base that is mounted to the duct or unit casing for ease in removal and replacement of the ion generator for servicing. The permanent base shall incorporate an electrical outlet with junction box for power.
b. Each unit shall be UL listed for assembly installation in a return air plenum.

C. Ion generators shall be equipped with auxiliary contacts to allow communication with the building energy management system.

2.4 IONIZATION REQUIREMENTS

A. Bi-Polar Ionization Generator(s)
1. Bi-polar ionization generator(s), capable of controlling gas phase contaminants, shall be provided for all equipment.
2. The bi-polar ionization system shall consist of power generators, remote monitor and power regulator, safety door switches, airflow switches, and other accessories required for safe and efficient operation.
3. Provide test jacks with a 1 to 4 volt output to indicate high voltage output with a standard multimeter on all units other than small self contained units which utilize type self contained filters.
4. The self contained generators, located at each duct location, shall be designed so that the electrodes must be disconnected prior to removal of the unit.
5. Each ion generator shall be provided with a 14G galvanized steel mounting plate with rib nuts and junction box that shall permanently mount to the duct. Removal of the ion generator for servicing shall not require removal of the base plate. All wiring between the junction box and unit shall be in metal flexible conduit or shall use MC cable. When tubes are utilized, there shall be adequate additional cable to allow removal of the unit with tube installed. Machine screws shall secure the ion generator to the mounting plate such that stripping of the duct will not occur over time due to standard maintenance procedures.
6. Provide an isolation transformer for each bi-polar ionization unit serving an A/C unit providing 1601 cfm and higher Ozone Generation

B. The operation of the electrodes or bi-polar ionization units shall conform to ASHRAE Standard 62.1 and CFR 39-75 with respect to ozone generation.

2.5 ELECTRICAL REQUIREMENTS

A. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Units shall be provided at the voltage and phase available. Electrical service shall be coordinated with the mechanical contractor and electrical contractor prior to ordering equipment. In the event line voltage varies 10% or greater from nominal or when electrical spikes or transients are present power conditioning shall be provided at no additional increase to the contract.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The units shall be installed in accordance with the manufacturer's instructions by the mechanical contractor. The electrical contractor shall complete single point power connections to the units.

B. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and consulting engineer.

C. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.

D. All equipment shall be protected from dust and damage on a daily basis throughout construction.

E. Clean all components prior to commissioning.

F. Install electrodes when commissioning air purification system.

3.2 TESTING

A. Provide the manufacturers recommended electrical and static pressure tests.

3.3 COMMISSIONING & TRAINING

A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.

B. Provide 5 copies of Operating and Maintenance Manuals.

C. Warranty and Service
   1. A manufacturer's authorized service representative shall provide service support to insure satisfactory air purification system operation. The service program shall include, at a minimum, factory startup and commissioning, bi-annual site visits for a period of four years, inspection of the air purification system and air handling equipment, monitoring and validation, inspection of protected areas, replacement of bad tubes and generator, and the submission of a written report to the owner and consulting engineer of record. This

service shall include the replacement of all the tubes at the end of the fourth year (labor and tubes). The service contract shall begin when project substantial completion has been granted.

2. Submit the Manufacturer's Service Program if requesting during the prior approval period.

3.4 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems and at accepted substantial completion, clean filter housings and install new filter media.

END OF SECTION 23 4310

SECTION 235543
WALL AND CEILING HEATERS

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 wall and ceiling heaters with propeller fans and electric heating elements.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For wall and ceiling heaters to include in emergency, operation, and maintenance manuals.

1.4 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.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Raywall.

2. Markel Products.
3. QMark Electric Heating.

2.2 ELECTRIC CEILING MOUNTED HEATERS

A. Provide heavy duty, ceiling mounted, forced air heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.

B. Heater shall be lay-in ceiling design mounted in the horizontal position. Unit shall contain vertical down discharge designed to supply heated air at the floor with unit mounted at 10'-0" above floor.

C. Fan motor shall be permanently lubricated, totally enclosed, shaded pole type with impedance protection. A protective shield shall surround the motor to separate return air from the supply air.

D. Heating element assemblies shall consist of two or three corrosion resistant steel sheathed elements, mechanically bonded to common corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire completely embedded in and surrounded by magnesium oxide, enclosed and swaged into corrosion resistant steel sheaths. Elements shall have no more than 60 watts per inch.

E. Heaters shall be equipped with a zero voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.

F. Provide wall mounted, heavy duty, tamper proof, low voltage thermostat.

G. Units shall be U.L. listed with integral disconnect switch.

2.3 ELECTRIC WALL HEATERS

A. Provide heavy duty, wall recessed mounted, forced air heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.

B. Heater shall be wall mounted in the vertical. Unit shall contain horizontal discharge.

C. Fan motor shall be permanently lubricated, totally enclosed, shaded pole type with impedance protection. A protective shield shall surround the motor to separate return air from the supply air.

D. Heating element assemblies shall consist of two or three corrosion resistant steel sheathed elements, mechanically bonded to common corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire completely embedded in and surrounded by magnesium oxide, enclosed and swaged into corrosion resistant steel sheaths. Elements shall have no more than 60 watts per inch.

E. Heaters shall be equipped with a zero voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.

F. Provide with integral, tamper proof, low voltage thermostat.

G. Units shall be U.L. listed with integral disconnect switch, and be manufactured by Markel, Raywall, or Berko.

2.4 ELECTRIC COVE HEATERS

A. Provide heavy duty, wall mounted, radiant/convention heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.

B. Heater shall be wall mounted in the vertical. Unit shall be directed downward designed to supply heated air into the vestibule.

C. Heaters shall be equipped with a zero voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.

D. Control by a wall mounted sensor connected to the building EMS. Provide a control relay for control of heater.

2.5 ELECTRIC UNIT HEATERS

A. Units shall consist of an outer casing containing electric heating elements, fan, fan guard, horizontal adjustable discharge louver and operating controls.

B. Units shall be designed and certified by Underwriters Laboratory (U.L.). or ETL.

C. Unit heater shall be equipped with high limit switch, integral T-stat, and four point connection.

D. Manufacturers shall be Chromalox, Markel, Berko, Trane, Modine, Reznor, Raywall, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall and ceiling heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before wall and ceiling heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly.

B. Install wall and ceiling heaters to comply with NFPA 90A.

C. Suspend wall and ceiling heaters from structure with threaded rod.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION 235543

SECTION 237200
OUTSIDE AIR 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 DOCUMENT INTENT

A. This specification is intended to provide product and performance requirements for all outside air units.

1.3 SUMMARY

A. Section Includes:
   1. Packaged outside air units, including required controls interface.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For packaged outside air units. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, 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. Suspended ceiling components.
   2. Structural members to which equipment or suspension systems will be attached.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged outside air units to include in maintenance manuals and warranty information.

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. Filters: One set of each type of filter specified.
   2. Fan Belts: One set of belts for each belt-driven fan in energy recovery units.
   3. Wheel Belts: One set of belts for each heat wheel.

1.8 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. ARI Compliance:
   1. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air- Cooling and Air-Heating Coils."

C. ASHRAE Compliance:
   1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
   2. Capacity ratings for packaged energy recovery ventilation units shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. UL Compliance:
   1. Packaged outside air units shall comply with requirements in UL 1812, "Ducted outside air unit."

1.9 COORDINATION

A. Coordinate layout and installation of packaged outside air units 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.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.10 WARRANTY, STARTUP AND TRAINING

A. A full Parts & Labor warranty shall be provided by the manufacturer for a period of 12 months from start-up. The manufacturer shall agree to replace/repair, within warranty period, components with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required provided manufacturer's instructions for handling, installation, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to defects and failures and does not include filters, belts or fuses. Warranty includes all parts, labor & travel during the warranty period.

B. Units shall be started-up by Manufacturer factory personnel – not an authorized representative of the factory. Complete start-up documentation shall be sent to the County after the job is completed. A minimum of two days training will be required for personnel after the job is complete. Manufacturer to provide factory direct (direct employee of the manufacturer) service personnel within 100 miles of the site.

C. Compressor warranty shall include parts for a period of 5 years

PART 2 - PRODUCTS

2.1 PACKAGED OUTSIDE AIR UNITS

A. outside air units shall be roof or grade mounted units consisting of a weather-proof housing mounted on a full roof curb and containing supply, cooling coil, compressor, hot gas reheat, electric or gas heat (as identified in the equipment schedule), filters and controls. The unit shall be completely factory assembled, pre-wired and thoroughly leak and safety control tested. After assembly, each unit shall be charged and run tested.

B. Units shall be U.L. or E.T.L. listed.

C. The housing shall be double wall construction of either steel or aluminum. Steel shall have G-90 galvanized coating. The outer housing shall be 20 gauge. Bases shall be 12 gauge. Inner liner shall be 24 gauge.

D. Cabinet insulation for all panels, including the unit sides, doors, and roof shall be 2" thick injected density closed cell foam insulation. Minimum R value shall be 13.0.

E. Provide unit with hail guards around the condensing coils.

F. Units shall be provided with factory disconnect and accessories for internal power wiring through the unit base.

G. The housing shall have hinged access doors on for access to fan motors, damper actuators, compressors, controls, and filters. Access doors shall be double wall construction and shall have full length stainless steel piano hinges and quarter turn tool-less latches.

H. Fresh air inlet shall have rain hoods and bird screens outside and motor operated dampers inside the unit which shall open when the fans start. Supply connections shall be inside the roof curb.

The roof curb shall not be used as a plenum. Exhaust damper may be barometric. In addition, the outside air damper and exhaust damper shall be provided with integral return air motorized damper to allow the unit to provide space humidity override during the unoccupied mode. Dampers shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage and shall meet the leakage requirements of the International Energy Conservation Code by leaking less than 4cfm/sf at 1" of static pressure and shall be AMCA licensed as Class 1. The actuators shall be direct drive.

I. The design of the cabinet shall allow access to the compressor and electrical control panel without impairing unit operation.

J. Unit base pan shall be constructed of minimum 18-gauge galvanized steel with caulked, taped, and screwed welded joints and seams and with water dams around all openings.

K. All exterior screws, nuts, bolts and washers shall be zinc, cadmium coated, or stainless steel and shall withstand a minimum of 1,000 hours Salt Spray Test per ASTM B117 97.

L. The housing which is constructed of G90 galvanized steel shall be chemically treated with zinc phosphate. All housings, either steel or aluminum shall be coated with 0.3 MIL polyurethane or alkyd primer, then finished with 0.8 mil polyester or acrylic urethane top coat. Finish shall meet or exceed 1,000 hour Salt Spray Test per ASTM B117 97.

M. Roof curbs shall comply with requirements of Division 07 Section "Roof Accessories".

N. Supply shall be direct drive, single width or double width backward inclined airfoil type with variable frequency drives or ECM motors for balancing the airflow. The complete blower and motor assembly shall be mounted on restrained spring vibration isolators.

O. Refrigerant cooling coils, condenser coils, subcooling coils, and hot gas reheat coils shall be aluminum fin, mechanically bonded to seamless copper tubing. Coils on units with two refrigerant circuits shall be split face type. Exposed condenser coils shall be protected by vinyl coated security screens or equivalent.

P. Compressors shall be hermetic scroll type with crankcase heater. Units with compressor capacity larger than eight tons shall have two compressors and two refrigerant circuits. The compressor(s) shall be variable capacity scroll and modulate from 10-100% of the compressor's capacity. Refrigerant circuit shall include accumulator, filter-dryer, sight-glass, dual gauge connections and thermal expansion valve. Safety controls shall include high pressure switch, low pressure switch and non-recycle timer. Head pressure shall be controlled by a variable frequency drive on the condenser fan.

Q. Compressors shall be installed in an insulated compartment accessible through hinged access doors and shall have a five year warranty.

R. Hot gas reheat coil shall be controlled by an electronically controlled step motor type valve positioned by the control system to maintain a constant leaving air temperature. On two compressor units the reheat coil shall be connected to the lead compressor only when the lead compressor can provide sufficient reheat at full and part load. Subcooling coils shall be controllable and shall be active only when hot gas reheat is enabled.

S. Indirect Fired Post Heaters

1. Heater shall conform to ANSI Z83.8. Unit shall be suitable for operation on natural gas or propane as specified. Unit shall be of down blast or horizontal configuration. Unit shall have an input rating of 100, 150, 200, 250, 300, or 400 MBH at full fire and shall be 4:1 turndown modulating output. Where input is greater than 400 MBH multiple heaters shall be used. It shall contain tube type heated exchangers, flue gas collector with vent fan, in shot burners, and controls for high and low fire. Unit shall be un-housed and fit within the unit housing envelope dimensions.
2. Burners shall be die formed in shot type. Burners must be individually removable for cleaning or service. Entire burner assembly must be easily removable as an assembly.
3. Unit shall have a powered venting system consisting of a collection box, direct drive vent fan and an air proving switch. The collection box shall be made of the same material as the heat exchanger bulkhead plate and shall be removable. The venting fan bearings shall have a minimum L10 bearing life of 24000 hrs. The vent fan shall exhaust the flue gas horizontally out the side of the unit. The unit fan shall operate on 120/1/60 and not exceed 2 FLA.
4. Tubes shall be permanently attached to a bulkhead plate to form an airtight seal between combustion byproducts and heated air system. Heat exchanger shall be constructed completely stainless steel. Heat exchanger shall be rated for a minimum lifespan of 100,000 cycles.
5. Gas train shall utilize components certified by AGA. Gas train shall consist of a 24 VAC two stage combination valve (manual on-off, automatic safety shutoff, regulation to handle 0.5 psig input pressure and adjustable pilot valve). The combination valve shall be rated at a flow of 400 MBH. The valve shall feed in shot burners through a manifold with screw in brass orifices sized for either natural gas or propane, as required by unit schedule. The flame controllers shall be solid state module that operates on 24 VAC. It shall have a built in spark igniter and flame sensor with 100% gas shutoff. The pilot shall be ignited during each cycle of operation. After the pilot is proven, the main burner valve shall open. Pilot and main burners shall be extinguished during the off cycle. The thermal disc type high temperature limit switch shall shut off the main and pilot valves if an overheat occurs.

T. Condensate pan shall be constructed of 304 stainless steel and shall be sloped to drain as required by ASHRAE 62-1989.

U. Filter racks shall be provided in supply air stream ahead of the coils. Filters shall be 2" thick pleated type with an efficiency of 30%. Filters shall be sized for a maximum of 500 fpm face velocity.

V. The outside air units shall be completely factory assembled and pre-wired with a single point electrical power connection. A main disconnect switch and motor starters with 3 overloads shall be factory mounted and wired in a weather-proof control panel. Each circuit shall be separately fused.

W. The unit manufacturer shall provide factory start-up and a representative from the county shall be present during start up. The start-up report shall be included in the close out documents. A copy of the start-up report shall be sent to the engineer as soon as the start-up is completed.

X. Outside air units shall be of the size and capacity scheduled on the drawings and shall be as manufactured according to these specifications by Trane, Daikin or Annexair.

2.2 CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors, or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors. Unit shall be provided with BACnet interface for communication with the BAS.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons.

C. Unit supply fan shall be configured for Constant Volume (ON / OFF) control.

D. Exhaust fan shall be configured for Constant Volume (ON /OFF) control.

E. Outside Air / Return Air damper control shall be field adjustable two-position network control.

F. Economizer control shall be temperature / dew point

G. Dirty filter sensor shall be factory-installed.

H. Operating protocol: The DDC shall be factory-programmed for BACnet.

I. Variable Frequency Drive (VFD) unit shall have factory installed variable frequency drive for modulation of the supply air blower assemblies and exhaust air blower assembly. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

J. Airflow monitoring required in the outdoor airstreams.

K. Duct mounted smoke detectors, installed in the supply air duct of the ERU shall shut down the unit when smoke is present.

L. The unit’s controls shall meet all sequences and alarms indicated within this specification section. Each unit shall be provided with a programmable timer to allow 24/7/365 time programming capability.

M. Unit Operation

1. Once an operating mode is selected by the unit controller or keypad/display, the supply fan will start. After air flow is proven, the unit will operate autonomously as described below:

a. In occupied mode, the enthalpy wheel will rotate. In occupied mode, the unit components will remain off until the space mounted humidity sensor indicates the

space is outside of setpoint – 60%RH or higher. In this condition, the unit will operate in dehumidification mode but the outdoor air damper will be closed and by-pass damper in the unit open to allow for air re-circulation.

b. Dehumidification**:** If the dew-point of the air entering the DX coil is higher than the supply air dew-point setpoint, then the unit will enter dehumidification mode. Unit microprocessor will stage internal components to deliver air at or below setpoints. During dehumidification, if supply air dry-bulb temperature gets too warm, even if the supply dew-point is being met, the variable compressor capacity will be increased to lower the supply air temperature. However, this will consume additional energy and the leaving air dry-bulb limit cannot be set below 72°F.

c. Cooling**:** If the dew-point of the air entering the DX coil is lower than the supply air dew-point setpoint and the temperature is greater than the leaving air dry-bulb setpoint, then the unit will enter cooling mode. Unit microprocessor will stage internal components to deliver air at the supply air dry-bulb setpoint. For units without space feedback, this air will be at the same setpoint as during DH, with a minimum of 72° F. Units with space feedback may deliver cooler air if the space temperature is above setpoint.

d. Heating**:** If the ambient temperature is below 55°F (adjustable), then heating will be enabled. For units without space feedback, the heater will be modulated to maintain 85°F (adjustable). Units with space feedback may deliver warmer or cooler air as dictated by space conditions.

N. Alarms

1. Critical Alarms(require reset, unit shutoff)

   a. Supply air flow
   b. Exhaust air flow
   c. Reactivation air flow
   d. Supply fan motor overload fault
   e. Exhaust fan motor overload fault
   f. Reactivation fan motor overload fault
   g. Smoke
   h. Heat fail & Supply Air Temp < 55°F

2. Non-Critical Alarms(require reset)
   a. Low suction pressure: Comp. A
   b. High discharge pressure: Comp. A
   c. Low differential pressure: Comp. A
   d. Enthalpy Wheel rotation
   e. Enthalpy Wheel motor fault
   f. Low suction pressure: Compressor B
   g. High discharge pressure: Compressor B
   h. Low differential pressure: Compressor B
   i. Sensors

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before packaged energy recovery ventilation unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

1. Install access doors in both supply, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.
2. Install removable panels or access doors between supply on building side for bypass during startup.

B. Install gas-fired units according to NFPA 54, "National Fuel Gas Code."

C. Roof Curb: Install packaged outside air units on curbs and coordinate roof penetrations and flashing with roof construction. Secure packaged energy recovery ventilation units to upper curb rail, and secure curb base to roof framing. Grade mounted units shall also be mounted on full perimeter curbs mounted on concrete pads. Unit designs requiring bottom discharge duct connections at grade mounted locations shall be provided with extended height curbs designed by the unit manufacturer to transition in the curb and provide duct connections in the side of the curbs to allow field installation of duct above grade. Roof mounting curbs shall comply with requirements of architectural Division 07 the specifications.

D. Install units with access and clearances for service and maintenance.

E. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

F. Pipe drains from drain pans to nearest roof drain.

3.3 CONNECTIONS

A. Install duct and piping adjacent to unit to allow service and maintenance.

B. Connect cooling condensate drain pans with air seal trap at connection to drain pan and install cleanouts at changes in pipe direction.

C. Gas piping serving the unit shall be designed by a Registered Professional Engineer. Connect gas piping with shutoff valve and union and with sufficient clearance for burner removal and service.

D. Install electrical devices furnished with units but not factory mounted. Electrical service to unit shall be designed by a Registered Electrical Professional Engineer.

E. Comply with requirements for ductwork specified in Section 23 31 13 "Metal Ducts."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory 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 service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   2. Adjust seals and purge.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   4. Set initial temperature and humidity set points.
   5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Packaged outside air units will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage Manufacturer factory personnel to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200

SECTION 238129
VARIABLE REFRIGERANT FLOW SYSTEM

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 split-system heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For variable refrigerant flow HVAC systems to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

E. Startup: Provide documentation of startup for system and components. Startup reports shall be provided with closeout documents.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Heat pump."

E. Installing contractor shall have experience with installation of variable refrigerant flow HVAC systems. Contractor shall have a minimum of 5 complete installations of variable refrigerant flow HVAC systems, which have been in operation a minimum of one year. Contractor shall be factory trains by variable refrigerant flow HVAC systems manufacturer's representative. This information shall be submitted with equipment submittal.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system heat pump units that fail in materials or workmanship within specified warranty period.

1. Compressors shall be warranted for five years.
2. Warranty Period: Remainder of unit one year from date of Substantial Completion and additional four years for compressor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trane
2. Mitsubishi Electronics America, Inc.; HVAC Division.
3. Daikin AC
4. Carrier

2.1 CONTROL

A. A central controller shall be provided for local control of the entire system. Unit controls shall be provided by the unit manufacturer and interface with the BAS via BACnet. The BACnet interface shall provide the following operable commands:

1. Time of day schedules.
2. Individual fan-coil set points.
3. Automatic heat/cooling change over.

4. Temperature set-point range restriction on individual space controllers.
5. System ON/OFF.

B. BACnet interface shall provide the followings:

1. Space temperature.
2. Units' alarms.
3. Mode of operation.
4. Filter Change.

2.2 EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
2. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Unit shall be wall or ceiling mounted ductless type fan-coil as scheduled with integral discharge deflection grilles, wall mounted controls, and easy to remove filters. Units shall be U.L. listed.

E. Interior of cabinet shall be insulated with 1/4 inch thickness fiberglass insulation. Cabinet shall include a condensate drain pan with anti-corrosion coating; die formed intake grille, permanent filter, and bi-directional discharge grille with auto-sweep feature.

F. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Special Motor Features: Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. General

1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.
2. High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.

3. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
4. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
5. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
7. The unit shall incorporate an auto-charging feature. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.
8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
12. The condensing unit shall be capable of heating operation at -13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
13. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.
14. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions

B. Casing:

1. Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

C. Compressor:

1. The inverter scroll compressors shall be variable speed controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type” or “J-type”.
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete

stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

4. The capacity control range shall be as low as 3% to 100%.
5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insolation.
9. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

D. Refrigerant Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum.
4. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
5. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.

E. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

F. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and shall be an adjustable external static.
3. The fan shall be a vertical discharge configuration
4. Nominal sound pressure levels shall be as shown below.
5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature.

G. Mounting Base: Polyethylene.

H. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.4 SENSING CEILING CASSETTE UNIT

A. General: Indoor unit shall be a round flow ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, direct drive DC (ECM) type fan, for installation into the ceiling cavity equipped with an air panel grill. It shall be a round flow air distribution type, white, impact resistant decorative panel. The supply air is distributed via four individually motorized louvers. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies. The indoor units sound pressure shall range from 30 dB(A) to 45 dB(A) at high speed measured at 5 feet below the unit.

B. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The round flow supply air flow can be field modified to 23 different airflow patterns to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.
6. The indoor units shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump provides up to 33-1/2” of lift from bottom of unit to top of drain piping and has a built in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered.
9. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor.
10. Supplied air shall be directed automatically by four individually controlled louvers.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Four auto-adjusted louvers shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
4. Outside air intake shall be through provided outside air intake kit.
5. A branch duct knockout shall exist for branch ducting of supply air.

6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
7. High efficiency air filters are available for each model unit.

D. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The airflow rate shall be available in three manual settings.
3. The DC fan shall be able to automatically adjust the fan speed in 5 speeds based on the space load.
4. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings to allow operation with the high efficiency air filter options.
5. The fan motor shall be thermally protected.

E. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.
2. Optional high efficiency disposable air filters shall be available.
3. Optional Self-Cleaning Filter Panel, which performs automatic filter cleaning up to once a day, with dust collection box that indicates when to be emptied.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2, or 3-row cross fin copper evaporator coil with up to 21 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/4 inch outside diameter PVC.
5. A condensate pan with antibacterial treatment shall be located under the coil.
6. A thermistor will be located on the liquid and gas line.

G. Control:

1. The unit shall have controls provided by unit manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.

2.5 4 WAY CEILING CASSETTE UNIT (2’x2’)

A. General: Indoor unit shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grill. It shall be a four-way air distribution type, white, impact resistant with a washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be

equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with remote control. The indoor units sound pressure shall range from 29 dB(A) to 34 dB(A) at low speed measured at 5 feet below the unit.

B. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21” of lift and has a built in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. All electrical components are reached through the decoration panel, which reduces the required side service access.
9. The indoor unit will be separately powered.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
4. Fresh air intake shall be possible by way of direct duct installation to the side of the indoor unit cabinet.
5. A branch duct knockout shall exist for branch ducting supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The airflow rate shall be available in high and low settings.
3. The fan motor shall be thermally protected.

E. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2-row cross fin copper evaporator coil with 17 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/32 inch outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 21 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. Control:

1. The unit shall have controls provided by unit manufacturer to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.

2.6 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Manufacturer’s recommended condensate pump kit

2.7 ATTIC STOCK

A. Two additional indoor fan-coil units of each size serving the classrooms shall be provided to the Owner for future use. One additional indoor fan-coil unit of each size serving other spaces shall also be provided.

B. Five additional control boards for indoor units shall be provided to the Owner for future use. Two additional control boards for outdoor units shall also be provided.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installing contractor shall be certified by the equipment manufacturer. All contractor installing personnel shall be certified by the equipment manufacturer.

B. Install units level and plumb.

C. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

D. Install ground-mounting, compressor-condenser components on 4-inch-thick, reinforced concrete base; 6 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch.

F. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Demonstration and Training" for additional requirements.

B. A minimum of four of the Owner's maintenance personnel shall be trained in installation and maintenance of the system's components at the manufacturer's national training center. The cost of training, travel, room, and board for these personnel shall be included in this contract.

END OF SECTION 238129

SECTION 238130
PACKAGED UNITS

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.

B. Division 23 Section "HVAC Instrumentation and Controls" for control wiring and control devices connected to rooftop (packaged) units.

1.2 SUMMARY

A. This section includes the following rooftop (packaged) air conditioners:
1. Cooling and heating units 6 tons and smaller.
2. Cooling and heating units 7-1/2 to 25 tons.

1.3 DEFINITIONS

A. BAS: Building automation system

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:
1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For packaged air conditioners to include in emergency, operation, and maintenance manuals.

D. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged air conditioners and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

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. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

D. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

F. ARI Certification: Units shall be ARI certified and listed.

G. ARI Compliance for Units with Capacities Less Than 135,000 Btuh: Rate packaged air-conditioner capacity according to ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment."
   1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

H. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate packaged air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."
   1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

I. Startup Reports: Provide startup reports after all units are operating. Reports shall be included in closeout documents.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

C. Coordinate size, location, and installation of rooftop (packaged) air-conditioner manufacturer's roof curbs and equipment supports with roof installer.

D. Coordinate installation of restrained vibration isolation roof-curb rails.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of packaged air conditioners 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 Final Completion.
   2. Warranty Period for Solid-State Ignition Modules: Manufacturer’s standard, but not less than three years from date of Final Completion.
   3. Warranty Period for Control Boards: Manufacturer’s standard, but not less than three years from date of Final Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PACAKGED AIR CONDITIONER UNITS

A. Manufacturers:
   1. Trane
   2. Carrier
   3. Daikin

B. Furnish and install factory assembled, piped and wired single package air conditioners of the type, size operational characteristics and capacity as shown and scheduled on the plans and as specified herein. Unit shall be a heat pump with an electric resistance heater. All units 3 tons and larger shall be equipped with a 100% modulating outside air economizer cycle.

C. Casings:
   1. Unit shall be designed specifically for outdoor installation. All components including accessories shall be contained within the unit.
   2. Unit shall be insulated with a minimum of one inch, one-pound density glass fiber insulation.
   3. Access panels shall be provided to allow maintenance of all unit components.

D. Compressor:
   1. Hermetic scroll compressors shall be provided with capacity reduction of a minimum of two steps for 6 tons and above. Units available with more stages, but not variable speed compressors, shall be provided with the additional stages.
   2. Hermetic scroll compressors shall be provided for all unit sizes.
   3. A crankcase heater shall be provided and wired to be active continuously.
   4. The compressors shall be provided with vibration isolators.
   5. Self-reversing oil pump shall provide positive lubrication regardless of rotation.
   6. Compressor shall receive a run-in test at the factory prior to installation into the units.
   7. Each compressor shall have a warranty covering parts failure for a period of five years.

E. Refrigerant circuit:

1. Coils shall be constructed of copper tubes mechanically bonded to aluminum fins. It shall be tested for leaks at 300 psig pressure prior to installation within the unit. Expansion valve and filter drier shall be factory installed.
2. The evaporator coil shall consist of separate refrigerant circuits with individual thermal expansion valves. Provide liquid line sight glasses and filter dryers. Each circuit shall have separate refrigerant controls.
3. Refrigeration controls shall include a reversing valve, minimum high- and low-pressure control, compressor winding thermostat and overload, lockout circuit resettable at the unit thermostat, contactors for condenser/evaporator fans and compressor, and control power transformer.
4. Condenser fans shall be direct driven propeller type using three phase motors.

F. Heating Section: This section shall include a tubular natural gas fired heat exchanger made of stainless steel. The design shall be AGA certified specifically for outdoor applications downstream from refrigerant cooling coils. The heat exchanger shall include AGA certified burner and gas train controls using direct spark ignition.

G. Evaporator Fan: Evaporator fan shall be direct or belt driven forward curved type with an adjustable sheave and motor sized to meet the air flow and static pressure as scheduled on the drawings. Motor shall have thermal overload protection and motor and fan bearings shall be permanently lubricated.

H. Filters: Two sets of 2", 35% efficient, pleated throwaway filters shall be provided with the units.

I. Refrigerant: Currently EPA approved, and available refrigerant based on project construction schedule.

J. Accessories to be provided:
1. Factory furnished and wired firestats. Return air firestats shall be set at 135 degrees and supply air firestats at 245 degrees wired so as to shut down the supply air fan if a fire exists. Firestats shall be of the manual reset type.
2. Low ambient operation kit (25 degrees F).
3. Fully automatic economizer cycle for units 3 tons and larger including factory installed controls with moisture eliminators and minimum position rheostat including dampers with modulating controllers and spring return operators. Provide barometric relief including exhaust dampers and exhaust hood.
4. Units serving fabric duct systems shall be equipped with soft start evaporator fan motor or variable speed drive on evaporator fan motor.
5. All units shall be furnished with an internal factory mounted 120 Volt convenience outlet. Outlet shall be powered separately from the unit to allow continued operation when the unit disconnect is off.
6. Unit shall be provided with dehumidification cycle, which consist of hot gas reheat coil. All associated wiring, tubing, and valves shall be provided, and factory installed. Unless noted otherwise all units shall be furnished with a dehumidification cycle.
7. Provide hail guards on all units.
8. Refer to plans for units that require horizontal duct connections versus downflow configuration.

2.3 ROOF MOUNTING CURBS

A. All roof mounting curbs shall comply with requirements of architectural division 07 specifications. Curb heights shall provide a final installation curb height a minimum of 12” above finished roof surface with curb mounted directly on roof structure. Curbs shall be mounted directly on roof structural members per structural requirements. Curbs shall be a minimum 14 gauge and meet the requirements of division 07 Roof Accessories. All roof curbs shall be approved by the Architect prior to placing order for construction.

B. Pad mounted units shall be provided with a minimum 14” curb.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances.

B. Curb Support: Install and secure roof mounted air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Controls shall be interfaced and connected per 23 0900 HVAC Instrumentation and Controls.

C. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
   1. Install ducts to termination in roof curb.
   2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
   3. Connect supply ducts to units with flexible duct connectors specified in Division 23 Section "Duct Accessories."

D. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 STARTUP SERVICE

A. Engage a factory-employed service representative to perform startup service. A letter from the manufacturer stating the installation meets the requirements of the warranty terms shall be provided.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
   1. Inspect for visible damage to unit casing.
   2. Inspect for visible damage to furnace combustion chamber.
   3. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
   4. Inspect internal insulation.
   5. Verify that labels are clearly visible.
   6. Verify that clearances have been provided for servicing.
   7. Verify that controls are connected and operable.
   8. Verify that filters are installed.
   9. Clean outside coil and inspect for construction debris.
   10. Clean furnace flue and inspect for construction debris.
   11. Connect and purge gas line.
   12. Adjust vibration isolators.
   13. Inspect operation of barometric dampers.
   14. Lubricate bearings on fan.
   15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
   16. Adjust fan belts to proper alignment and tension.
   17. Start unit according to manufacturer's written instructions.
   18. Start refrigeration system in summer only.
   19. Complete startup sheets and attach copy with Contractor's startup report.
   20. Inspect and record performance of interlocks and protective devices; verify sequences.
   21. Operate unit for an initial period as recommended or required by manufacturer.
   22. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
   23. Start refrigeration system and measure and record the following:
   24. Coil leaving-air, dry- and wet-bulb temperatures.
   25. Coil entering-air, dry- and wet-bulb temperatures.
   26. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
   27. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

3.4 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months of date of Final Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.5 FIELD QUALITY CONTROL

A. During construction unit filters shall be periodically changed while the unit is in operation. This shall include unit filter as well as a filter media to be placed over the return grilles. The unit filter and filter media shall be dated at each replacement. If the ductwork or evaporator coil

becomes dirty, the contractor shall clean the ductwork and coil. The contractor shall provide the owner a letter stating that all coils have been inspected and are clean at substantial completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop (packaged) air conditioners. Refer to Division 1 Section "Demonstration and Training".

3.7 CLOSEOUT DOCUMENTATION

A. Properly completed start-up forms, including equipment marks and serial numbers, documenting proper start-up service, adjusting, and demonstration shall be received by the Owner prior to granting of substantial completion.

END OF SECTION 238130

DIVISION 26

ELECTRICAL SPECIFICATIONS

PREPARED BY

John Averrett, PE

SECTION 26 0001 - ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. All Electrical work required.

B. All Telecommunications required.

C. All Low Voltage Systems work required.

1.02 REGULATORY REQUIREMENTS

A. Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications.

B. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be U.L. approved as installed.

C. Jurisdiction: Where codes or guides refer jurisdiction to local governing code officials, such official in the procedure shall be the State Fire Marshal.

D. Electrical: Conform to the National Electrical Code, NFPA 70, 2023 Edition.

E. Energy: Conform to the International Energy Conservation Code, 2009 Edition with all Georgia State Amendments.

F. Accessibility: Conform to Americans with Disability Act.

G. Fire Prevention: Conform to Georgia State Minimum Fire Prevention Code, 2012 Edition, with all Georgia State Amendments.

H. Building Code: Conform to International Building Code, 2012 Edition, with all Georgia State Amendments.

1.03 ELECTRICAL SYSTEM DESCRIPTION

A. A new pad-mounted transformer will be provided by Walton EMC. The new pad mounted transformer will be 480V 3-phase secondary. Transformer primary shall be by the Power Company. The transformer secondary shall be by the Contractor. The transformer pad shall be by the Power Company.

B. A new 3-phase 4-wire 600Amp main distribution panel (MDP) will be provided.

1. 25% spares or spaces will be provided in the main distribution panel.

2. The MDP will have ground fault protection for the main breaker.

3. The MDP will have a surge protective device (SPD).

C. Sub-panels and feeders will be provided based on the building layout and power needs of various spaces.

1. 25% spare breakers will be provided in all panelboards.

D. Voltage Selection:

1. Motors 1/2 Hp and larger will operate at 480V, 3-phase, unless location or manufacturer requirements dictate otherwise.

2. Motors less than 1/2 Hp will operate at 120V single phase.

3. Lighting will operate at 120V single phase. except for exterior parking lot lighting & gym lighitng, which will be at 277V single phase.

E. Receptacles and branch circuits will be provided based on the building layout and power needs of various spaces.

1. Unless noted otherwise, each receptacle branch circuit will have a dedicated neutral.

2. Each office will be on a dedicated circuit.

3. Each cubicle will be on a dedicated circuit.

4. No more than four computers will be on one circuit.

5. General receptacles will be limited to no more than six on one circuit.

F. LED lighting, lighting controls, and switching will be provided based on the building layout and the requirements of each space.

1. Lighting levels will be designed in accordance with the Illuminating Engineering Society Lighting Standards and the Georgia State Energy Code.

2. Interior lighting will be LED, using 2x4 fixtures, pendants, downlights, and specialty lighting as appropriate for each space.

3. Illumination shall be provided for all working spaces about service equipment, switchboards, switchgear, panelboards, or motor control centers installed indoors and shall not be controlled by automatic means only.

G. Emergency and Exit lighting:

1. Emergency power will be provided by select battery backup fixtures specified for the various spaces.

2. Emergency lighting will be provided in each mechanical and electrical room.

3. Emergency lighting will be provided as a minimum in interior windowless spaces intended for group use. No space requiring emergency lighting can have a single point of failure. Therefore, spaces requiring emergency lighting will have at least two emergency fixtures.

H. Lighting Controls:

1. All spaces will include provisions for automatic shutoff. Occupancy sensors will be utilized where practical (offices, restrooms, meeting rooms, study rooms, etc.). Lighting in very large spaces or spaces with unique geometry or large vertical elements (such as shelves or stacks) will be controlled with a programmable lighting control panel.
2. Each space will contain a local device to control the lights in that space. All lighting controls will be readily accessible. Programmable lighting control panels will be have associated timed override switches, local to the space(s) controlled.
3. Task lighting will be provided with individual switches.
4. Spaces with Audio Visual functions will have programmable dimming controls, interfaced with the AV system, and zoned appropriate to the functions of each space.

I. Grounding:

1. Power system grounding will be provided in accordance with the NEC and as described herein.
2. A new grounding triad consisting of driven ground rods connected by a grounding electrode conductor will be provided.
3. A copper ground bar will be provided adjacent to the MDP for connection to the grounding electrode conductor from the triad. This bar will be the common grounding point for all other grounding electrode conductors in the building.
4. A ground bar will be provided adjacent to each dry-type transformer. The separately derived system will be bonded at this bar. These ground bars will be connected together and connected back to the main ground bar adjacent to the MDP with #4/0 bare copper, forming the building grounding riser.
5. Ground plates will be provided in the Data Rooms. These ground plates will be connected together with #4/0 bare copper, and will connect back to the main ground bar adjacent to the MDP from one single point, forming a separate telecommunications grounding riser.
6. Equipment in the Data Room will be bonded to the ground plate in that room with #6 green jacketed cable.
7. A bonding conductor of #6 green jacketed cable will be routed along with and bonded to the building cable tray.
8. Ground rods will be 3/4", 10 long solid copper. Exothermic connections will be used for underground connections.

J. A new discretely addressable fire alarm system shall be provided.

K. A new structured data system will be provided.

L. The following special systems are anticipated in this building. The Contractor will provide all components, equipment, wiring, and programming for these systems. Manufacturers shall match campus standards.

1. Card Access
2. Video surveillance
3. CATV in designated areas

M. Power will be provided to plumbing and HVAC equipment. The contractor will provide all switches, safety disconnects, and enclosed circuit breakers required.

1. Outdoor HVAC equipment will have weatherproof GFCI receptacles within 25-feet to meet NEC maintenance requirements.
2. Power will be routed through the HVAC control device, such as variable frequency drive or starter.
3. Power and fire alarm interface will be provided to smoke control dampers.
4. Any electrical equipment requiring interface to the Building Automation System will be furnished with a factory-installed BACnet interface card/module.

N. Lightning Protection is not anticipated for this building.

1.04 SUBMITTALS

A. Supplementing Division 1 requirements, the Contractor shall:

1. Review the submittal data and check to ensure the compliance with the specifications prior to submitting.
2. Assemble the submittal data in complete sets, with numbered index sheets and tabs. Data shall include product dimensions, voltage, phase, amp ratings, shop drawings, wiring diagrams, product data sheets with characteristics, accessories, and options highlighted.
3. Review the power wiring requirements for the approved HVAC equipment. Provide a tabulation indicating compliance with the electrical connections shown.
4. Wiring Diagrams -Provide for each of the following:
   a. Programmable Lighting Control Panels
   b. Dimming Systems
   c. Fire Alarm System
   d. Structured Data System

5. Layout Drawings - Provide for Occupancy Sensors.
6. Certificates: Provide Manufacturer's Certificates to certify that the installation of major equipment meets or exceeds manufacturer's requirements for:
   a. Fire Alarm System
   b. Lighting Controls - Programmable and Occupancy Sensors
   c. Structured Data System
7. Project Record Documents: The Contractor shall record actual locations of equipment and path of all conduits 3" and larger, and any changes in branch circuiting.
8. Operation Instructions: The Contractor shall instruct the Using Agency on equipment maintenance and system operation using a factory authorized training representative.
9. Operating and Maintenance Manuals: The Contractor shall provide two copies for use by the Using Agency.

1.05 QUALITY ASSURANCE

A. Commissioning Support Requirements:
   1. The Contractor will provide assistance to the Commissioning Authority (CxA) for scheduling and witnessing of testing. The Contractor will review the prefunctional and functional test procedures to ensure feasibility, safety, and equipment protection.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Deliver equipment to project site in protective containers.

B. Store equipment under cover and elevated above grade.

PART 2 PRODUCTS

2.01 SECTION 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. Manufacturers: Made in USA.

B. All conductors shall be copper.

C. Conductors shall be Type THHN/THWN in dry locations, type XHHW in damp or wet locations including underground.

D. MC Cable is not allowed.

E. Conductors shall be a minimum of #12 AWG.

2.02 SECTION 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. An equipment grounding conductor will be provided in all feeders and branch circuits. Conduit will not be used as the grounding conductor.

B. Ground rods will be 5/8" diameter 10 feet long solid copper.

C. A new triad of new driven ground rods connected by bare copper #3/0 will be provided.

2.03 SECTION 26 2529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

A. Electrical panels, enclosed breakers, and safety disconnect switches on the building interior will be mounted on plywood backboards.

B. Equipment mounted on the exterior will not be mounted on plywood backboards.

C. Hangers and supports will be appropriate for the substrate to which they are attached.

2.04 SECTION 26 0534 CONDUIT

A. All raceway provided under electrical shall be Rigid Metal Conduit (RMC) or Intermediate Metallic Conduit (IMC), except that Electrical Metallic Tubing (EMT) may be used concealed in dry locations.

B. MC Cable will be allowed where concealed inside drywall partitions or above ceilings. No MC Cable will be exposed. All MC Cable shall transition to rigid conduit prior to termination at panelboards.

C. Ten 3/4" EMT conduits shall be provided across all hard ceilings for future use. These conduits shall originate and terminate above accessible ceilings.

D. Final connections to all HVAC and plumbing equipment and to dry type transformers will be liquidtight flexible metallic conduit (LFMC).

2.05 SECTION 26 0536 CABLE TRAYS

1. Not anticipated

2.06 SECTION 26 0537 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

C. Floorboxes and Poke-throughs:

1. Manufacturers and Models for Floorboxes: Legrand Evolution EFB6; Hubbell System-One.

2. Manufacturers and Models for Poke-throughs: Legrand 4FFATC; Hubbell System- One 4".

2.07 IDENTIFICATION FOR ELECTRICAL SYSTEMS

A. Provide mechanically attached (not adhered), engraved, white on black nameplate with minimum 1/4" high lettering on each panelboard and disconnect switch. Indicate panel name, voltage, and "served from" information.

B. Label each receptacle plate and switch cover with panel and circuit number. These labels shall be typewritten.

C. Mark circuits with a permanent magic marker inside each receptacle box to indicate serving panelboard and circuit number.

D. Clearly label each piece of equipment with panel and circuit number.

E. Provide a dated, typewritten panelboard directory card in plastic window frame on inside of panelboard doors. Clearly indicate the area and devices supplied by each circuit. At the top of the directory type (in bold letters) the location in the building of the breaker which feeds that panel.

F. Electrical equipment requiring preventive maintenance shall be permanently identified.

2.08 SECTION 26 2200 LOW-VOLTAGE TRANSFORMERS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet.

2. Ambient Temperature: Not exceeding 86 degrees F average or 104 degrees F maximum measured during any 24 hour period.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Manufacturers:

1. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.
2. GE Industrial: www.geindustrial.com.
3. Siemens: www.siemens.com
4. Hammond Power Solutions, Inc.

2.09 SECTION 26 2416 PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Provide service entrance rated where indicated on plans. At service entrancepanel, provide power meter with local display and capability to connect to building management system. The meter shall measure kilowatts.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.
2. Ambient Temperature:
   a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
2. Listed series ratings are not acceptable.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
2. Boxes: Galvanized steel unless otherwise indicated.
    a. Provide wiring gutters sized to accommodate the conductors to be installed.
3. Fronts:
    a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list and label panelboards as a complete assembly including surge protective device.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

M. Manufacturers:

1. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.
2. GE Industrial: www.geindustrial.com.
3. Square D: www.squared.com.
4. Siemens

2.10 SECTION 26 2417 SURGE PROTECTIVE DEVICES

A. Electrical Requirements:

1. Unit Operating Voltage - Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) - The MCOV shall not be less than 125% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes - The SPD must protect all modes of the electrical system being utilized. The required protection modes are:

a. Line-to-Neutral

b. Line-to-Ground

c. Line-to-Line

d. Neutral-to-Ground

5. Nominal Discharge Current (In) - All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.

6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) - The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

a. 480Y/277 Volts:

1) L-N, L-G, N-G = 1200

2) L-L = 2000

b. 208Y/120 Volts:

1) L-N, L-G, N-G = 800

2) L-L = 1200

B. Manufacturers:

1. APT
2. Liebert
3. Square D
4. General Electric
5. Eaton
6. Siemens
7. Surge Suppression, Inc.

2.11 SECTION 26 2726 WIRING DEVICES

A. Switches and convenient outlets shall be gray in color.

B. Covers shall be stainless steel.

C. Commercial grade wiring devices shall be used, minimum 20 amperes.

D. Ground Fault Circuit Interrupters (GFCIs) will be provided for all exterior circuits including outdoor lighting of all types and all circuits in wet areas such as restrooms, kitchens, etc.

E. Exterior covers shall be weatherproof in-use type.

2.12 SECTION 26 2813 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Use only fuses of voltage, amperage and class compatible with fuse holder or disconnect.

F. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

G. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.13 SECTION 26 2817 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

D. Conductor Terminations: Suitable for use with the conductors to be installed.

E. Provide thermal magnetic circuit breakers unless otherwise indicated.

F. Provide electronic trip circuit breakers where indicated.

G. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

H. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

   a. Indoor Clean, Dry Locations: Type 1.

   b. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

3. Provide surface-mounted enclosures unless otherwise indicated.

J. Provide externally operable handle with means for locking in the OFF position.

2.14 SECTION 26 2818 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch (H.P. Rated).

1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle and switching mechanism integral with switch base, with easily recognizable position and lockable in OFF position.
3. Visible blades.
4. Non-teasible, positive, quick-make, quick-break mechanism.
5. Line terminal shields.
6. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch (H.P. Rated).

1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle and switching mechanism integral with switch base, with easily recognizable position and lockable in OFF position.
3. Visible blades.
4. Non-teasible, positive, quick-make, quick-break mechanism.
5. Line terminal shields.

C. Enclosures: NEMA KS 1.

1. Interior Dry Locations: Type 1.
2. Exterior locations: Type 3R

2.15 SECTION 26 3213 ENGINE GENERATORS

A. Not anticipated for this project

2.16 SECTION 26 3600 TRANSFER SWITCHES

A. Not anticipated for this project.

2.17 SECTION 26 5100 INTERIOR LIGHTING

A. LUMINAIRES

1. Provide products that comply with requirements of NFPA 70.
2. Provide products that are listed and labeled as complying with UL 1598, where applicable.
3. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
4. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, drivers, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
5. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
6. Provide products suitable to withstand normal handling, installation, andservice without any damage, distortion, corrosion, fading, discoloring, etc.
7. Recessed Luminaires:
   a. Ceiling Compatibility: Comply with NEMA LE 4.
   b. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

2.18 SECTION 26 5200 SENSOR LIGHTING CONTROLS

A. 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.

B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

C. Where applicable, occupancy sensors shall be wired in a "Manual ON/ Auto OFF" configuration.

D. Set the factory default to Auto OFF at 20 minutes.

E. Manufacturers:

1. The WattStopper
2. Mytech
3. Leviton
4. Hubbell

5. Pass & Seymour
6. Lutron
7. Lightolier
8. Novitas
9. Lithonia

2.19 SECTION 27 1005 STRUCTURED CABLING FOR DATA

A. General:

1. The system shall be a structured data system. The electrical contractor shall be responsible for the installation of boxes & conduit stub to the above ceiling only. Cabling for the various low voltage systems shall be by the client IT department or local vendors, Electrical contractor shall coordinate with the vendor for the exact locations required for install system infrastructure.

B. Site:

1. A total of two 4” conduits shall be provided into the main data IDF room for provider cabling. Electrical contractor shall route conduit to nearest overhead pole.

C. GROUNDING REQUIREMENTS PER THE NEC AND TIA/EIA J-STD-607-A (Commercial Building Grounding and Bonding Requirements for Telecommunication, October 2002)

2.20 SECTION 28 3100 FIRE ALARM SYSTEM

A. Fire Alarm System:

1. A new, discretely addressable fire alarm system shall be provided in the facility. The system will be expandable to allow for future devices. All alarm devices shall be combination audio/visual devices with devices located in each classroom and public or handicap toilet area and any areas where two or more people would gather for work, study, instruction or conferencing. Mounting heights of alarm devices and pull stations will comply with ADA criteria. All fire alarm cabling shall be routed in raceway.
2. Audible/Visual indicators and visual indicators shall be located in the facility according to ADA and NEC codes. Voice evacuation shall be provided where required.
3. Water flow switches and valve indicator switches both inside the building and on the site shall also be connected to the fire alarm panel.
4. A remote graphic annunciator shall be located near the main entrance.
5. Manufacturers: GE/Edwards; Notifier; FCI/Gamewell/Honeywell.
6. Fire alarm cable shall be in factory painted red 1/2" EMT.
7. Interfaces shall be provided to HVAC equipment for Air Handler shutdown, elevator controls, and other equipment as required.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions, all regulatory requirements, and NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. All work shall comply with NFPA 70.

C. Install Fire Alarm in accordance with NFPA 72.

D. Maintain clearances and access around electrical equipment as required in NEC Article 110.

3.02 TESTING

A. Testing:

1. The contractor shall measure the impedance to ground from the bus of the main switchgear with all breakers open and the system neutral-to-ground bonding jumper removed.

2. The contractor shall test circuit breakers 100 amps and larger for resistance of contacts, instantaneous trip.

3. The contractor shall perform a megohm test of all phase and neutral conductors from the service transformer, through the main switchgear, through all distribution panelboards and to all branch circuit panelboard main busses.

3.03 STARTING EQUIPMENT AND SYSTEMS

A. Provide manufacturer's field representative to prepare, start, and test:

1. Lighting control systems

2. Fire Alarm System

3. Access Control System

4. Video Surveillance System

B. Provide manufacturer's representative to train Owner in operation of:

1. Lighting control systems

2. Fire Alarm System

3. Access Control System

4. Video Surveillance System

C. Operate all circuit breakers and disconnect switches.

D. Adjust equipment for proper operation in accordance with manufacturer's recommendations and requirements.

3.04 ADJUSTING

A. Adjust equipment for proper operation including torque settings in accordance with manufacturer's recommendations and requirements.

3.05 COMMISSIONING TESTS

A. Provide assistance to the Commissioning Authority (CxA) for scheduling and witnessing of testing.

B. Review the Prefunctional and Functional test procedures to ensure feasibility, safety, and equipment protection.

3.06 CLEANING

A. All electrical gear and conduits inside electrical rooms shall be wiped down prior to material completion.

B. All electrical rooms shall be free of construction materials. Sweep and mop floors and equipment bases.

C. Paint equipment where finish has been damaged with retouching of finish to match factory finish.

D. Vacuum debris including metal shards from panel cans prior to installation of interiors.

E. Vacuum the interior of floorboxes prior to installing coverplate and devices.

F. Wipe down all light fixtures, fire alarm devices, and wiring devices prior to material completion.

G. Any wiring devices that have been painted over and cannot be cleaned satisfactorily will be replaced by the contractor.

H. Condition of Work Upon Project Completion:

1. The condition of equipment and work upon project completion shall be NEW and UNDAMAGED. For example, broken fixture lenses and dented or scratched housings shall be replaced. Painted-over wiring devices shall be cleaned or replaced. Do not use tape or other adhesive for temporary labels, as they leave residue. All circuit breaker factory-printed data/information shall be legible and undamaged. Panelboards and transformers shall be free of scratches, dents, and rust. Any equipment or work deemed by the design professional as not meeting the requirement of NEW and UNDAMAGED shall be replaced by the Contractor at no cost to the Owner.

3.07 FINISHING ELECTRICAL EQUIPMENT

A. Use paint systems specified in Section 09 9000 for the substrates to be finished.

B. Leave conduits in electrical and mechanical rooms unfinished.

C. Paint conduits and boxes in finished areas with ceilings exposed to structure in accordance with finish schedule in architectural drawings/specifications.

END OF SECTION

SECTION 260500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work under this item of the Contract shall include the furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete electrical systems, including exterior and interior of buildings as shown on the drawings and specified herein.

B. The CONTRACTOR shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by the manufacturer, trade name, or catalog number establishes the quality standards of materials and equipment required for this installation and is not intended to exclude products equal in quality and similar in design. Where two or more designations are listed, choice shall be optional with the Contractor. The Engineer reserves the sole right to decide the equality of materials proposed for use in lieu of those specified.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
1. Division 310000 – Earthwork
2. Division 270000 – Low Voltage
3. Division 230000 - Mechanical

1.3 CODES, PERMITS, AND INSPECTIONS

A. Comply with applicable laws of the community, with latest edition of NEC where not in conflict with those laws, and with the service rules of the local utility company. Obtain and pay for all permits required. After completion of the work, submit certificate of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.4 DRAWINGS AND SPECIFICATIONS

A. Consider as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Engineer in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions; verify all dimensions and existing conditions.

1.5 CONFLICTS, COORDINATION AND CHANGES

A. In the event that interferences or conflicts develop, the ENGINEER shall decide which equipment shall be relocated regardless of which was first installed. In the interest of avoiding such conflicts, the electrical sub-contractor who is using common space such as mechanical rooms, chases, ceiling space, etc., shall coordinate his work with all other trades and other parts of his own work.

If, during this coordination, it is discovered that necessary or desirable changes should be made, advise the ENGINEER and secure his decision in writing.

1.6 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's product specifications, standard details, certified product test results, installation instructions, accessories and general recommendations, as applicable to materials and finishes for each component.

C. Samples: Provide samples indicated in each Section, representative of products and/or components to be provided.

D. Color Selection: Where a color selection is required and is not preselected, include physical samples of materials and full range of colors available at bid date.

E. Shop Drawings: Provide shop drawings where indicated or otherwise required for complete and proper illustration of products, systems and installation, including in part, showing layouts, details, elevations, edge conditions, joints, corners, profiles, supports, anchorages, trim, flashings, closures, accessories, special details and similar conditions. Distinguish between factory and field assembly work. The manufacturer's technical engineering department shall approve the drawings before they are submitted.

F. Qualification data for manufacturer, Design Engineer, fabricator and installer.

G. Sample of warranties specified and of incidental warranties of components, which are all to be extended to the Owner.

1.7 WARRANTY

A. Warrant the entire electrical system in proper working order. Replace, without additional charge, all work or material which may develop defects (ordinary wear and tear or damage resulting from improper handling excepted) within a period of one year from date of final acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall be new and shall be listed as approved by the Underwriter's Laboratories, Inc. in every case where a standard has been established for the particular type of material in question. All work shall be executed in workmanlike manner and shall present a neat and mechanical appearance when completed.

2.2 ELECTRICAL SERVICE

A. General: Coordinate with owner. Provide all material and labor so as to produce a complete installation meeting the owner regulations. The Electrical Contractor shall be responsible for including all fees associated with bringing power to this site in their original bid. Contractor shall include an allowance in their bid of at least $10,000.00 to cover any fees associated with bringing

power to this site.

B. Metering: Obtain metering equipment from Utility Company and install in compliance with the Utility Company's requirements.

C. Main Service Equipment: Provide U.L. listed service entrance components as shown or specified hereinafter.

D. Service Feeder: Of type and size shown on Riser Diagram. Extend (2)5" PVC with Poly-Pull 48" deep underground from service equipment to transformer location (verify exact location with Utility Company). Install utility furnished pull boxes as shown on drawings and terminate conduit at transformer as directed by the Utility Company and leave sufficient slack conductors for connection to transformer lugs. Coordinate any increase or decrease in service size with utility.

E. Transformer: Will be furnished and installed by Utility Company on concrete pad for underground service. Installation shall be in accordance with Utility Company standard drawings. Provide connectors as directed by Utility Company for terminating feeder at transformer lugs. Coordinate any increase or decrease in transformer size with utility.

PART 3 - EXECUTION

3.1 VISIT TO SITE

A. Before submitting a bid, visit the site and ascertain all existing conditions. Make such adjustments in work as are required by the actual conditions encountered.

3.2 CUTTING AND CHASING

A. Where possible all work shall be built in as the job progresses. Where this is not possible, secure approval and do necessary cutting, chasing, etc. required. Do not cut through any structural members without securing approval in advance; such holes shall be neatly cut or drilled – not chipped.

3.3 TRENCHING AND BACKFILLING

A. Do all excavating necessary for installation of work; backfill trenches and excavations after work has been installed and inspected. Backfill within the building and under paved areas shall meet compaction requirements and fill material shall be pit run gravel or similar granular material.

3.4 ELECTRICAL SERVICE INSTALLATION

A. Project Conditions: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated.

B. Notify Project Manager and Owner no fewer than seven days in advance of proposed interruption of electrical service.

C. Indicate method of providing temporary electrical service.

D. Do not proceed with interruption of electrical service without Project Manager's written permission.

END OF SECTION 260500

SECTION 260519

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 Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Copper building wire rated 600 V or less.
2. Aluminum building wire rated 600 V or less.
3. Metal-clad cable, Type MC, rated 600 V or less.
4. Armored cable, Type AC, rated 600 V or less.
5. Photovoltaic cable, Type PV, rated 2000 V or less.
6. Mineral-insulated cable, Type MI, rated 600 V or less.
7. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 260513 "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 601 to 35,000 V.
2. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
3. Section 271313 "Communications Copper Backbone Cabling" for twisted pair cabling used for data circuits.
4. Section 271513 "Communications Copper Horizontal Cabling" for twisted pair cabling used for data circuits.

1.3 DEFINITIONS

A. PV: Photovoltaic.

B. RoHS: Restriction of Hazardous Substances.

C. VFC: Variable-frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

C. Product Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer's authorized service representative.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
   1. Alcan Products Corporation; Alcan Cable Division.
   2. American Insulated Wire Corp.; a Leviton Company.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.
   6. Carol Wire and Cable.Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. RoHS compliant.
   3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

B. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

C. Conductor Insulation:
   1. Type THHN and Type THWN-2: Comply with UL 83.
   2. Type UF: Comply with UL 83 and UL 493.
   3. Type XHHW-2: Comply with UL 44.

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; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

E. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

F. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

G. PV Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN, single conductors in raceway. Type XHHW-2, single conductors in raceway

B. Exposed Feeders: Type THHN, single conductors in raceway

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN, single conductors in raceway

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN, single conductors in raceway

E. Feeders Installed below Raised Flooring: Type THHN, single conductors in raceway

F. Feeders in Cable Tray: Type THHN, single conductors in raceway

G. Exposed Branch Circuits, Including in Crawlspaces: Type THHN, single conductors in raceway

H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN, single conductors in raceway

I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN, single conductors in raceway

J. Branch Circuits Installed below Raised Flooring: Type THHN, single conductors in raceway

K. Branch Circuits in Cable Tray: Type THHN, single conductors in raceway

L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. 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.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

SECTION 260526

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 Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Ground bonding common with lightning protection system.
   3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Test wells.
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
      1) Test wells.
      2) Ground rods.
      3) Ground rings.
      4) Grounding arrangements and connections for separately derived systems.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: 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 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 wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

G. Conduit Hubs: Mechanical type, terminal with threaded hub.

H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with socket set screw.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

M. Straps: Solid copper, cast-bronze clamp. Rated for 600 A.

N. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal [**one**] [**two**]-piece clamp.

O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

P. Water Pipe Clamps:
1. Mechanical type, two pieces with stainless steel bolts.
   a. Material: Die-cast zinc alloy.
   b. Listed for direct burial.
2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, 3/4 inch by 10 feet

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

C. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6AWG 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 equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches 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, and down; 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 AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 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 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 above to 6 inches 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 according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: 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 from the foundation.

3.4 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. 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. 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.

H. Metallic Fences: Comply with requirements of IEEE C2.
   1. Grounding Conductor: Bare tinned copper, not less than No. 8 AWG.
   2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
   3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 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. Ground Bonding Common 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 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.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
   1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. 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 bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. 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; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by 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.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. 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.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod, extending around the perimeter of area or item indicated.
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's foundation.

J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use 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's grounding grid or to grounding electrode external to concrete.

K. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. 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 no fewer 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.
4. 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.

F. Grounding system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds:10 ohms.

I. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529

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. Section Includes:
1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Nonmetallic slotted support systems.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

B. Related Requirements:
1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

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 the following:
a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.
2. Include rated capacities and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) 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. Suspended ceiling components.
   2. Ductwork, piping, fittings, and supports.
   3. Structural members to which hangers and supports will be attached.
   4. Size and location of initial access modules for acoustical tile.
   5. Items penetrating finished ceiling, including the following:
      a. Luminaires.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in other related sections, to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."
   2. Component Importance Factor: 1.0.

C. 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 Rating: Class 1.
   2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c. in at least one surface.
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.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Stainless steel, Type 316.
3. Channel Width: Selected for applicable load criteria
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.
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. Fabco Plastics Wholesale Limited.
   d. Seasafe, Inc.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Channel Width: Selected for applicable load criteria
3. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
4. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
5. Rated Strength: Selected to suit applicable load criteria.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Conduit and Cable Support Devices: Steel 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 nonarmored 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 made of 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.
      Manufacturers: Subject to compliance with requirements, provide products by one of 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 where used.
      Manufacturers: Subject to compliance with requirements, provide products by one of 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 are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
   4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are 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.

2.3 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 Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
   1. NECA 1.
   2. NECA 101
   3. NECA 102.

4. NECA 105.
5. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. 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, or single-bolt conduit clamps using spring friction action for retention in support channel.

F. 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, RMC may be supported by openings through structure members, according to 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: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, beam clamps (MSS SP-58, 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 by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "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.

C. Anchor equipment to concrete base as follows:
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. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533

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 and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
3. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Sustainable Design Submittals:

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

D. Samples: For wireways, nonmetallic wireways and surface raceways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
   4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel or aluminum.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: compression.
   3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
   4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. Certain Teed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fiberglass:
   1. Comply with NEMA TC 14.
   2. Comply with UL 2515 for aboveground raceways.
   3. Comply with UL 2420 for belowground raceways.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Rigid HDPE: Comply with UL 651A.

G. Continuous HDPE: Comply with UL 651A.

H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

I. RTRC: Comply with UL 2515A and NEMA TC 14.

J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Comply with UL 514B.

L. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, 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. Wireway Covers: Screw-cover type unless otherwise indicated.

D. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
   Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Thomas & Betts Corporation.
   b. Walker Systems, Inc.; Wiremold Company (The).
   c. Wiremold Company (The); Electrical Sales Division.

2.5 BOXES, ENCLOSURES, AND CABINETS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
14. Rittal

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Metal Floor Boxes:
   1. Material: Cast metal.
   2. Type: Fully adjustable or semi-adjustable.
   3. Shape: Rectangular.
   4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
   1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
   1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Gangable boxes are prohibited.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:
   1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: Rigid Steel Conduit
   2. Concealed Conduit, Aboveground: Rigid Steel Conduit
   3. Underground Conduit: RNC,Type EPC-40-PVC
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC, Type UA only.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed: Rigid Steel Conduit. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
      d. Gymnasiums.
   2. Concealed in Ceilings and Interior Walls and Partitions: EMT
   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: Rigid Steel Conduit
   5. Boxes and Enclosures: NEMA 250, Type 1, Type 3R, or Type 4x stainless steel as indicated on the plans.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Change from ENT to RNC, Type EPC-40-PVC to Rigid Steel Conduit for vertical turn before rising above floor. Use long radius 90s for conduit 1-1/2” trade size and larger.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:
1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:
   1. Material: Galvanized sheet steel.
   2. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
      b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers:
      a. Advance Products & Systems. Inc.
      b. BWM Company
      c. CALPICO, Inc.
      d. Flexicraft Industries
      e. Metraflex Company
      f. Pipeline Seal and Insulator, Inc.
      g. Proco Products, Inc.
   2. Sealing Elements: Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Stainless steel.
   4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
   1. Manufacturer:
      a. HOLDRITE: Reliance Worldwide Company

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553

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. Section Includes:
1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

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 electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. 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 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Black letters on an white field.
   2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.
   1. Color shall be factory applied or field applied for sizes larger than No. 1/0 AWG if authorities having jurisdiction permit.
   2. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   3. Colors for 240-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
   4. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.
   5. Color for Neutral: White.
   6. Color for Equipment Grounds: Green or Green with a yellow stripe.
   7. Colors for Isolated Grounds: Green with white stripe.

C. Raceways and Cables Carrying Circuits at More Than 600 V:
   1. Black letters on an orange field.
   2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

D. Warning Label Colors:
   1. Identify system voltage with black letters on an orange background.

E. Warning labels and signs 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 LABELS

A. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable it identifies and that stay in place by gripping action.

B. Self-Adhesive Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 SIGNS

A. Instructional Signs:
1. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) 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.1/4-inch grommets in corners for mounting.

2.5 CABLE TIES

A. Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50lb (22.6kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

C. Provide Arc Flash warning labels on panelboards, MCCS, etc. required by NEC where not already provided by the manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
   1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
   1. Secure tight to surface of conductor, cable, or raceway.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

J. Emergency Operating Instruction Signs: 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.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
   1. "EMERGENCY POWER."
   2. "POWER."

3. "UPS."

M. Vinyl Wraparound Labels:
   1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
   2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

O. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Labels:
   1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

T. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
   1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

W. Underground Line Warning Tape:
   1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
   2. Limit use of underground-line warning tape to direct-buried cables.
   3. Install underground-line warning tape for direct-buried cables and cables in raceways.

END OF SECTION 260553

SECTION 260923

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. Section Includes:
1. Time switches.
2. Outdoor and indoor Photoelectric switches.
3. Lighting contactors.
4. Emergency shunt relays.

B. Related Requirements:
1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
2. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of 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. Novitas, Inc.
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 SPST or DPST dry contacts rated for 1800 VA inductive, to operate connected load, complying with UL 773, and compatible with CFL and LED lamps.
   1. Light-Level Monitoring Range: Turn on: 1-3 fc, Turn off/Turn off Ratio 15 max.
   2. Time Delay: Thirty-second minimum, to prevent false operation.
   3. Lightning Arrester: Mov.
   4. Mounting: Twist lock complying with NEMA C136.10, with base.
   5. Failure Mode: Luminaire stays ON.

2.2 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. 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 systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 CONTACTOR INSTALLATION

A. Comply with NECA 1.

B. 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.

END OF SECTION 260923

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 260500 – Electrical

1.3 SUBMITTALS

A. Submit product data in accordance with Section 260500 or any other related specifications.

1.4 QUALITY ASSURANCE

A. Comply with NEMA PB 1.

B. Comply with NFPA 70.

1.5 COORDINATION

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, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and framework requirements as specified on plans.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Panelboards, Over-current Protective Devices, Controllers, Contactors, and Accessories:
      a. Eaton Corp.; Cutler-Hammer Products.
      b. Siemens Energy & Automation, Inc.
      c. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1, as indicated on plans.
   1. Rated for environmental conditions at installed location.

a. Outdoor locations: NEMA 250, Type 3R or 4x SS as indicated.
b. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.
7. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
8. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
3. Isolated Equipment Ground Bus (where indicated on schedules): Adequate for branch circuit equipment ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus (where indicated on schedules): Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
5. Split Bus (where indicated on schedules): Vertical buses divided into individual vertical sections.

C. Conductor Connectors: Suitable for use with conductor material.
1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Compression type.
3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installations of devices.

2.3 PANELBOARD SHORT-CIRCUIT RAITING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals. Series rating is not acceptable.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

B. Main Over-current Protective Devices: Circuit Breaker or Fused switch as indicated on plans.

C. Branch over-current protective devices shall be one of the following:
1. For Circuit Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit

breakers where individual positive-locking device requires mechanical release for removal.

3. Fused switches.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers are specified in Section 16410 “Enclosed Switches and Circuit Breakers”.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install over-current protective devices and controllers.
   1. Set field adjustable switches and circuit breaker trip ranges.

E. Install filler plates in unused protective device spaces.

F. Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section "Electrical Identification".

B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

Example:

PANEL A
PHASE A – BROWN
PHASE B – ORANGE
PHASE C – YELLOW
NEUTRAL – GRAY
GROUND - GREEN

3.3 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. 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 PANELBOARDS

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets

1.2 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:
1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.4 INFORMATION SUBMITTALS

A. Field quality-control reports.

1.5 CLOSE OUT SUBMITTALS

A. Operation and maintenance data.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in Part 2 articles:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device – Kellems (Hubbell).
3. Leviton Mfg. Company, Inc. (Leviton).
4. Pass & Seymour/Lagrand (Pass & Seymour)

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING – DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A; Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-593
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper, 5351 (single), CR5362 (duplex).
      b. Hubbell; HBL5351 (single), HBL5352 (duplex).
      c. Leviton; 5891 (single), 5352 (duplex).
      d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:
   1. Straight blade, feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper, VGF20.
      b. Hubbell; GFR5352L.
      c. Pass & Seymour; 2095.
      d. Leviton; 7590

2.5 USB CHARGER RECEPTACLE

A. General Description:
   1. Straight blade, feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the USB charger is working.
   4. Shall have two USB ports 3A, 5Vdc, Type A. 2.0.

B. Duplex USB Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide a product equal to the following:
      a. Hubbell: USB20X

C. Toggle Switches: Comply with NEMA WD 1, UL 20, and FS W-S-896.

D. Switches,120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Single Pole:
         1) Cooper, AH1221.
         2) Hubbell; HBL1221.
         3) Leviton; 1221-2.
         4) Pass & Seymour; CSB20AC1.
      b. Two Pole:
         1) Cooper; AH1222.
         2) Hubbell; HBL1222.
         3) Leviton; 1222-2.
         4) Pass & Seymour; CSB20AC2.
      c. Three Way:

1) Cooper; AH1223.
2) Hubbell; HBL1223.
3) Leviton; 1223-2
4) Pass & Seymour; CSB20AC3.

d. Four Way:
1) Cooper; AH1224.
2) Hubbell; HBL1224.
3) Leviton; 1224-2
4) Pass & Seymour; CSB20AC4.

E. Pilot-Light Switches, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper, AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off" F.

F. Key-Operated Switches, 120/277 V, 20A
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper: AH1221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper, 6252.
b. Hubbell; DR15.
c. Leviton; 16252.
d. Pass & Seymour; 26252.

B. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and US 943 Class A.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; VGF15.
b. Hubbell; GF15LA.
c. Leviton; 8599.
d. Pass & Seymour; 1594

C. Toogle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper, 7621 (single pole), 7623 (three way).
b. Hubbell; DS115 (single pole), DS315 (three way).
c. Leviton; 56291-2 (single pole), 5623-2 (three way).
d. Pass & Seymour; 2621 (single pole), 2623 (three way).

D. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 7631 (single pole), 7633 (three way).

b. Hubbell; DS120IL (single pole), DS320 (three way).
c. Leviton; 5631-2 (single pole), 5633-2 (three way).
d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 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: 0.035-inch-(1-mm-) thick, satin-finished stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant aluminum heavy-duty "in-use", lockable cover.

2.8 FINISHES

A. Device Color:
1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or black walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is compete.

C. Conductors:
1. Do no strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in it package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moments.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing meter-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair finished and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. 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, multi-gang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through- type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles.
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damage conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests inspections.

D. Prepare test and inspection reports.

END OF WIRING DEVICES

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fuses rated 600 V and less.
   1. Cartridge fuses rated 600 V and less for use in switches, panelboards, switchboards, controllers, and motor-control centers.
   2. Spare-fuse cabinets.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 260500 – Electrical

1.3 SUBMITTAL

A. Submit product data in accordance with Section 260500 and other related specification sections.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from one source by a single manufacturer.

B. Comply with NEMA FU 1.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Quantity equal to 10 percent of each fuse type and size, but no fewer than 3 of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products.

B. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
   1. Cooper Bussmann, Inc.

2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
3. Ferraz Shawmut, Inc.
4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.3 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: “SPARE FUSES” in 1-1/2-inch high letters on exterior of door.
   4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Service Entrance: Class L time delay (601A-6000A); RK1 time Delay (0-600A).

B. Feeders: Class L time delay (601A-6000A); RK1 time delay (0-600A).

C. Motor Branch Circuits: Class RK1 time delay.

D. Other Branch Circuits: Class RK1 time delay.

3.2 INSTALLATION

A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse. Verify indicated fuse sizes with equipment nameplate and installation instructions.

B. Install spare-fuse cabinet(s).

C. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF FUSES

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Molded-case circuit breakers.
   4. Enclosures.

1.2 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Spares: For the following:
      a. Potential Transformer Fuses: 1 set for each ampere rating used for the project.
      b. Control-Power Fuses: 1 set for each ampere rating used for the project.
      c. Fuses and Fusible Devices for Fused Circuit Breakers: 1 set for each ampere rating used for the project.
      d. Fuses for Fusible Switches: 1 set for each ampere rating used for the project.
      e. Fuses for Fused Power Circuit Devices: 1 set for each ampere rating used for the project.
   2. Spare Indicating Lights: Six of each type installed.

1.3 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 260500 - Electrical

1.4 SUBMITTALS

A. Product Data: Submit data in accordance with Section 260500 and other related specification sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Square D/Group Schneider
   2. Siemens Energy & Automation, Inc.
   3. Eaton Corporation; Cutler-Hammer Products.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD heavy duty, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD heavy duty, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.

2.2 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:
   1. Square D/Group Schneider.
   2. Siemens Energy & Automation, Inc.
   3. Eaton Corporation; Cutler-Hammer Products.
   4. General Electric

B. Molded-Case Circuit-Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents as indicated on plans.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. 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-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time time adjustments.
      d. Ground-fault pickup level, time delay, and I^2t response.
   4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
   5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
   6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories: Features and Accessories shall apply when noted on plans
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment
   4. Ground-Fault Protection: relay and trip unit with adjustable pickup and time delay settings, push-to-test feature, and ground-fault indicator.
   5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
   6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

7. Auxiliary Switch: Two SPDT switches with “a” and “b” contacts; “a” contacts mimic circuit-breaker contacts, “b” contacts operate in reverse of circuit-breaker contacts.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Listing: The circuit breaker ampere rating shall be readily legible (without removing interior cover) on switch handle facing away from the breaker. Legible text shall be high contrast in relation to breaker molding, example if breaker molding is black, use legible white text.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1, Type HS to meet environmental conditions of installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
2. Corrosive Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

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.

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

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

3.3 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF ENCLOSED SWITCHES AND CIRCUIT BREAKERS

SECTION 264313

SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

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 SPDs for low-voltage power, control, and communication equipment.

B. Related Sections include the following:
1. Division 26 Section "Wiring Devices" for devices with integral SPDs.
2. Division 26 Section "Switchboards" for factory-installed SPDs.
3. Division 26 Section "Panelboards" for factory-installed SPDs.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. SVR: Suppressed voltage rating.

C. TVSS: Transient voltage surge suppressor (known now as SPD.)

D. SPD: Surge Protection Device

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.

B. Product Certificates: For transient voltage suppression devices, signed by product manufacturer certifying compliance with the following standards:
1. UL 1283.
2. UL 1449 3rd edition.

C. Qualification Data: For testing agency.

D. Field quality-control test reports, including the following:
1. Test procedures used.
2. Test results that comply with requirements.
3. Failed test results and corrective action taken to achieve requirements.

E. Operation and Maintenance Data: For transient voltage suppression devices to include in emergency, operation, and maintenance manuals.

F. Warranties: Special warranties specified in this Section.

SCHEDULE 1 - Provide test reports from a recognized independent testing laboratory verifying the COMPLETE SPD will survive the published and specified maximum surge current rating. Test reports will clearly show that all components that make up a COMPLETE system were included in these tests (including but not limited to all necessary fuses, thermal disconnects, integral disconnects and monitoring systems).

SCHEDULE 2 - Provide data confirming that the SPD will survive the published and specified repetitive surge current rating (longevity characteristic).

SCHEDULE 3 - Per the requirements of NEC Article 285.6, provide test data demonstrating that the SPD is capable of surviving the published and specified short circuit current capability (AIC rating) without the use of external fusing.

SCHEDULE 4 - Provide a COMPLETE set of test and ratings data per the recommendations of NEMA LS1 – 1992.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

C. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

D. 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.

E. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."

F. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

G. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

B. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:
   1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
   2. Operating Temperature: 30 to 120 deg F.
   3. Humidity: 0 to 85 percent, noncondensing.
   4. Altitude: Less than 20,000 feet above sea level.

C. Placing into Service: Do not energize or connect service entrance equipment, panelboard, control terminals, data terminals, to their sources until the surge protective devices are installed and connected.

1.7 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

B. Coordinate surge protection devices with Division 26 Section "Electrical Power Monitoring and Control."

1.8 WARRANTY

A. General Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within ten (10) years from date of Substantial Completion.

B. Special Warranty for Cord-Connected, Plug-in Surge Suppressors: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge suppressors.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Replaceable Protection Modules: One of each size and type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Liebert Corporation; a division of Emerson.
2. Surge Suppression, Inc.
3. Advanced Protection Technologies, Inc.
4. Current Technology, Inc.
5. Cutler-Hammer, Inc.; Eaton Corporation.
6. Intermatic, Inc.
7. LEA International.
8. Square D; Schneider Electric.

B. Manufacturers of Category A and Telephone/Data Line Suppressors:
1. EDCO
2. NTE Electronics, Inc.
3. Telebyte Technology, Inc.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protection Device Description: Non-modular type:

The SPD will be provided with the following features and accessories:
1. Repetitive Rating: SPD shall be capable of surviving at least 10,000 ANSI/IEEE C62.41 Category C3 impulses (10kA) without failure or less than 10% degradation of original performance characteristics.
2. Fusing system to provide 200kAIC short circuit rating.
3. Individually fused MOVs to provide system redundancy
4. Integral disconnect (only when a breaker is NOT provided in distribution equipment)
5. LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 5A and 250V ac, for remote monitoring of protection status.
8. NEMA 12 Enclosure.

B. Surge Protection Device Description: Modular type:

The modular SPD will be provided with the following features and accessories:
1. Repetitive Rating: SPD shall be capable of surviving at least 15,000 ANSI/IEEE C62.41 Category C3 impulses (10kA) without failure or less than 10% degradation of original performance characteristics.
2. Fusing system to provide 200kAIC short circuit rating.
3. Fabrication using bolted compression lugs for internal wiring.
4. Integral disconnect switch (only when a breaker is NOT provided in distribution equipment).
5. Individually fused MOVs to provide system redundancy.
6. Built-in push-to-test feature that tests the integrity of each fuse/MOV pair. Manufacturers who accomplish by use of an external surge generator will provide the device with their quotation.
7. Redundant replaceable modules

8. Arrangement with copper bus bars and for bolted connection to phase buses, neutral bus, and ground bus.
9. Arrangement with wire connection to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Audible alarm, with silencing switch, to indicate when protection has failed.
12. One set of dry contacts rated at 5A and 250V ac, for remote monitoring of protection status.
13. Surge event operations counter.
14. NEMA 4 Enclosure

C. Peak Single-Impulse Surge Current Rating: 250 kA per phase, 125kA per mode. Manufacturer will provide a higher maximum surge current rating if necessary to meet the repetitive requirements listed above. Connection Means:

D. Connection Means: Permanently wired.

E. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277, 208Y/120, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 400 V for 208Y/120 and 700V for 480Y/277V.
2. Line to Ground: 400 V for 208Y/120 and 700V for 480Y/277V.
3. Neutral to Ground: 400 V for 208Y/120 and 700V for 480Y/277V.

F. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

G. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

H. Protection modes and UL 1449 SVR for voltages of 240, 480, or 600, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: 2000V for 480V, 1000V for 240V, 2500V for 600V.
2. Line to Ground: 2000V for 480V, 1000V for 240V, 2500V for 600V,

2.3 PANELBOARD SUPPRESSORS

I. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:
1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.

J. Surge Protection Device Description: Modular design with field-replaceable modules, sign-wave-tracking type with the following features and accessories:
1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.

3. Integral disconnect switch.
4. Redundant suppression circuits.
5. Redundant replaceable modules.
6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
7. LED indicator lights for power and protection status.
8. Audible alarm, with silencing switch, to indicate when protection has failed.
9. One set of dry contacts rated at 5 A and 250-V, ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
10. Surge-event operations counter.

K. Peak Single-Impulse Surge Current Rating: 80 kA per phase.

L. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 208Y/120, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 400 V for 208Y/120.
2. Line to Ground: 400 V for 208Y/120.
3. Neutral to Ground: 400 V for 208Y/120.

M. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

N. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

O. Protection modes and UL 1449 SVR for voltages of 240, 480, or 600, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: 1000 V for 240 V.
2. Line to Ground: 800 V for 240 V.

2.4 SUPPRESSORS FOR BRANCH PANELS

A. Surge Protection Device Description: Sine-wave-tracking type, panel-mounted design with the following features and accessories:
1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status.
4. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
5. Fusing system to provide 200kAIC short circuit rating.
6. Repetitive Rating: SPD shall be capable of surviving at least 6,000 ANSI/IEEE C62.41 Category C3 impulses (10kA) without failure or less than 10% degradation of original performance characteristics.
7. NEMA 4X Enclosure

B. Peak Single-Impulse Surge Current Ratings; 130 kA per phase, 65kA per mode. Manufacturer will provide a higher maximum surge current rating if necessary to meet the repetitive requirements listed above.

C. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277 208Y/120, 600Y/347, 4-wire circuits shall be as follows:
1. Line to Neutral: 800 for 480Y/277, 400V for 208Y/120, 1200V for 600Y/347.
2. Line to Ground: 800V for 480Y/277, 400V for 208Y/120, 1200V for 600Y/347.
3. Neutral to Ground: 800V for 480Y/277, 400V for 208Y/120, 1200V for 600Y/347.

D. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

E. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

F. Protection modes and UL 1449 SVR for voltages of 240, 480, or 600, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: Line to Line: 2000V for 480V, 1000V for 240V, 2500V for 600V.
2. Line to Ground: 2000V for 480V,1000V for 240V, 2500V for 600V.

2.5 PLUG-IN SURGE SUPPRESSORS

A. Description: Non-modular, plug-in suppressors with at least four 15-A, 120-V ac, NEMA WD 6, Configuration 15-15R receptacles, suitable to plug into a NEMA WD 6, Configuration 15-15R receptacle; with the following features and accessories:
1. LED indicator lights for power and protection status.
2. LED indicator lights for reverse polarity and open outlet ground.
3. Circuit breaker and thermal fusing. When protection is lost, circuit opens and cannot be reset.
4. Circuit breaker and thermal fusing. Unit continues to supply power if protection is lost.
5. Close-coupled direct plug-in.
6. Rocker-type on-off switch, illuminated when in the on position.
7. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and No. 4.

B. Peak Single-Impulse Surge Current Rating: 26 kA per phase.

C. Protection modes and UL 1449 SVR shall be as follows:
1. Line to Neutral: 475 V.
2. Line to Ground: 475 V.
3. Neutral to Ground: 475 V.

2.6 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Locate the externally mounted SPD as close as possible to the panelboard neutral lug. Locate the recommended breaker as close as possible to the SPD location. The panelboard manufacturer will supply the breaker. Do not exceed manufacturer’s recommended lead length. Do not bond neutral and ground.

C. Provide a 60A, multi-pole circuit breaker in the service entrance equipment and a 30A, multi- pole circuit breaker in branch panel equipment to serve as a dedicated disconnect for suppressor, unless otherwise indicated.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 PLACING SYSTEM INTO SERVICE

A. Do not energize or connect panelboards to their sources until surge protection devices are installed and connected.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust equipment installation, including connections, and to assist in field testing. Report results in writing.
   1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. Testing: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports:

C. Testing: Perform the following field tests and inspections and prepare test reports:
   1. After installing surge protection devices, but before electrical circuitry has been energized, test for compliance with requirements.
   2. Complete startup checks according to manufacturer's written instructions.

3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transient voltage suppression devices. Refer to Division 01 Section "Demonstration and Training."

B. Train Owner’s maintenance personnel on procedures and schedules for maintaining suppressors.

C. Review data in maintenance manuals. Refer to Division 1 Section “Contract Closeout.”

D. Review data in maintenance manuals. Refer to Division 1 Section “Operation and Maintenance Data.”

E. Schedule training with Owner, through Architect, with at least seven days’ advanced notice.

END OF SECTION 264313

SECTION 26 51 19

LED INTERIOR LIGHTING

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 following types of LED luminaires:
1. Cylinder.
2. Downlight.
3. Highbay, linear.
4. Linear industrial.
5. Lowbay.
6. Parking garage.
7. Recessed linear.
8. Strip light.
9. Surface mount, linear.
10. Surface mount, nonlinear.
11. Suspended, linear.
12. Suspended, nonlinear.
13. Materials.
14. Finishes.
15. Luminaire support.

B. Related Requirements:
1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 26 09 26 "Lighting Control Panelboards" for panelboards used for lighting control.
3. Section 26 09 33 "Central Dimming Controls" or Section 26 09 36 "Modular Dimming Controls" for architectural dimming systems and for fluorescent dimming controls with dimming ballasts specified in interior lighting Sections.
4. Section 26 09 43 . 16 "Addressable-Luminaire Lighting Controls" and Section 26 09 43 . 23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include emergency lighting units, including batteries and chargers.
   5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
   6. Photometric data and adjustment factors based on laboratory tests IES LM-79.
      a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
      b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

D. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

E. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
   1. Include Samples of luminaires and accessories involving color and finish selection.

F. Samples for Verification: For each type of luminaire.
   1. Include Samples of luminaires and accessories to verify finish selection.

G. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) 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. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment and luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:
    a. Other luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Ceiling-mounted projectors.
7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.
   1. Obtain Architect's approval of luminaires in mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE 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.

B. Standards:
1. ENERGY STAR certified.
2. California Title 24 compliant.
3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
5. UL Listing: Listed for damp location.
6. Recessed luminaires shall comply with NEMA LE 4.
7. User Replaceable Lamps:
   a. Bulb shape complying with ANSI C78.79.
   b. Lamp base complying with ANSI C81.61.

C. CRI of minimum 80. CCT of 3500 K.

D. Rated lamp life of 50,000 hours to L70.

E. Lamps dimmable from 100 percent to 0 percent of maximum light output.

F. Internal driver.

G. Nominal Operating Voltage:
1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

H. Housings:
1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.

2.3 MATERIALS

A. Metal Parts:
1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter, shape, size, wattage, and coating.
      c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:
1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls or attached to a minimum 20 gauge backing plate attached to wall structural members in order to position luminaire accordingly.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 26 09 43 . 16 "Addressable-Luminaire Lighting Controls."

B. Comply with requirements for startup specified in Section 26 09 43 . 23 "Relay-Based Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
   2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 266010

THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:
   1. Section 260500 - Electrical

1.3 SUBMITTALS

A. Submit the following in accordance with any other related specification section:
   1. Product Data: Including (but not limited to) process design, equipment information, installation requirements.
   2. Shop Drawings: Including (but not limited to) equipment layout, electrical wiring diagrams, anchor bolt placements.

B. Operations and Maintenance Data: In accordance with any other related section.

1.4 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are UL Listed, produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
   1. Fire-resistance-rated walls including firewalls, fire partitions, fire barriers, and smoke barriers.
   2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and Ceiling membranes of roof/ceiling assemblies.
   3. Fire stopping method shall comply with UL “Fire Resistance Directory” requirements for rated assembly in which it is to be installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
   1. Hilti, Inc.

2. RectorSeal Corporation (The).
3. 3M; Fire Protection Products Division.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATIOIN FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

3.2 IDENTIFY THROUGH-PENETRATIOIN FIRESTOP SYSTEM

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
   1. The words "Warning – Through-Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name.

END OF THROUGH-PENETRATED FIRESTOP SYSTEMS

SECTION 26 91 00

OCCUPANCY SENSORS

PART 1 - GENERAL

1.1 SUMMARY

A. The Occupancy Sensor system shall sense the presence of human activity within the desired space and fully control the "On" / "Off" function of the lights.

B. Sensing technologies shall be completely passive meaning that they will not emit any radiation that is known to interfere with certain types of hearing aides, or electronic devices such as electronic white board readers. Acceptable programmable shall be Passive Infrared (PIR), and/or PIR/Microphonic Passive Dual Technology (PDT). Ultrasonic or Microwave based sensing technologies shall not be accepted.

C. Time Delay settings shall be factory set at 20 minutes, and shall not be field adjusted unless specifically instructed by Architect. This delay selection is based on lamp life vs. energy savings and sensor performance. Automatic adjustments to this delay period by the sensor shall not be permitted.

D. In high humidity or cold environments, the sensors must be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.

E. Installer, in accordance with manufacturer's recommendation, shall determine final sensor location. All sensors shall have non-adjustable factory calibrated sensitivity for maximum performance. Time Delay and Photocell field adjustments shall be provided as needed.

F. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

G. All applicable products must be UL Listed or other acceptable national testing organization.

H. Product must be manufactured in the USA and be warranted for 5 years.

1.2 APPROVED MANUFACTURER AND SUBSTITUTIONS

A. Approved manufacturer shall be Sensor Switch, Inc. (800) 727-7483 www.sensorswitch.com

B. Substitutions must be submitted no less than 5 days prior to bid date. An AutoCAD drawing of the facility showing coverage patterns and technical data must be provided with substitution request. All substitutions must clearly identify any and all exceptions to the specifications with a detailed explanation as to the exception. If substitution is approved, the contractor shall bear the responsibility of a fully functional system to the owner's and Architect's satisfaction.

PART 2 – PRODUCTS

2.1 WALL SWITCH SENSORS – SMALL AREAS

A. Sensor shall recess into single gang switch box and fit a standard GFI opening.

B. Sensor must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.

C. Sensor shall use PIR sensing incorporating a nominal one half inch focal length lens viewing 9 inches above and below horizontal view pattern measured at 10 feet.

D. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, and no switch as specified.

E. In areas with inboard/outboard switching, sensor shall provide two dedicated relays and override switches. Each relay shall have independent programmable time delays.

F. In areas with obstructions to the occupant's workspace, sensor shall utilize programmable dual technology PIR/Microphonic sensing.

G. All models shall have "Reduced Turn On". This is a field programmable function for problematic areas with unforeseen reflective surfaces. False turn on shall be eliminated with this feature.

H. Sensor shall be the following Sensor Switch model numbers. Device color and optional features as specified.

1. WSD (PIR)

2. WSD-2P (PIR inboard/outboard)

3. WSD-PDT (PIR/Microphonic)

4. WSD-PDT-2P (PIR/Microphonic inboard/outboard)

5. WSD-SA (PIR Semi-Automatic)

6. WSD-PDT-SA (PIR/Microphonic Semi-Automatic)

2.2 WALL SWITCH SENSORS – LARGE AREAS

A. Sensor shall surface mount to single gang switch box.

B. Sensor shall use PIR sensing incorporating a nominal one-inch focal length lens viewing 9 inches above and below horizontal view pattern measured at 20 feet.

C. Sensor shall have optional feature for photocell/daylight override.

D. In areas with inboard/outboard switching or two circuits, sensor shall provide two dedicated relays and override switches.

E. In areas with obstructions to the occupant's workspace, sensor shall utilize dual technology PIR/Microphonic sensing.

F. Sensor shall be the following Sensor Switch model numbers. Device color and optional features as specified.

1. LWS (PIR)

2. LWS-2P (PIR inboard/outboard or two circuits)

3. LWS-PDT (PIR/Microphonic)

4. LWS-PDT-2P (PIR/Microphonic inboard/outboard or two circuits

2.3 LOW VOLTAGE SENSORS

A. Sensors shall operate on a class 2, three-conductor system. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 milliamps so that up to 14 sensors may be connected to a single power pack.

B. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.

C. In areas with clear line of site view of the workspace, sensors shall use PIR detection. In areas with obstructions, sensors shall use PIR/Microphonic detection.

D. Optional interface with Building Automation System (BAS): Each zone designated shall provide one sensor with a SPDT class 2 relay providing a digital input to BAS. All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that Power Pack must be installed on the Line side of the local toggle switch for Relay to work properly.

E. Specific sensors shall have optional feature for photocell/daylight override, and/or Low Temperature/High Humidity environments.

F. Sensors shall be the following Sensor Switch model numbers.

1. CM-9 (PIR Ceiling)

2. CM-PDT (PIR/Microphonic Ceiling)

3. CM-10 (PIR Ceiling-Extended Range)

4. CM-PDT-10 (PIR/Microphonic Ceiling-Extended Range)

5. WV-16 (PIR Wall Mount)

6. WV-PDT (PIR/Microphonic Wall Mount)

7. HW-13 (PIR Hallway)

8. HM-10 (PIR High Bay Aisle Way)

9. CM-6 (PIR High Bay)

2.4 POWER PACKS

A. Power Packs shall accept 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.

B. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.

C. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.

D. Power Pack shall incorporate a Class 1 relay and an A/C electronic switching device. The A/C electronic switching device shall make and break the load, while the relay shall carry the current in the On condition. This system shall provide full 20 amp switching of all load types, and be rated for 400,000 cycles.

E. Power Packs shall be single circuit, or two circuits. Slave Packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.

F. Power Packs shall be the following Sensor Switch model numbers.

1. PP-20 (Single Pole)

2. PP-20-2P (Two Pole)

3. SP-20 (Slave Pack)

2.5 PHOTOCELLS AND DIMMING/DAYLIGHT HARVESTING

A. Photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.

B. Photocell shall provide for an On/Off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.

C. Photocell set-point and deadband shall be automatically calibrated through the sensor's micro-controller by initiating the "Automatic Set-point Programming" subroutine. Further adjustment may be made manually if needed. Deadband setting shall be verified and modified by the sensor

automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

D. Low voltage Dimming Sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable ballasts by sinking up to 20 milliamps of class 2 current (typically 40 or more ballasts).

E. Low voltage Dimming Sensor's set point shall be automatically calibrated through the sensor's micro-controller by initiating the "Automatic Set-point Programming" subroutine. Min and Max dim settings as well as set-point may be manually entered.

F. Low voltage Dimming Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)

G. Combination Photocell/Dimming Sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the On/Off function as well as the dimming function of 0 to 10 VDC dimmable ballasts.

H. Combination Photocell/Dimming Sensor's set-point and deadband shall be automatically calibrated through the sensor's micro-controller by initiating the "Automatic Set-point Programming" subroutine. Min and Max dim settings as well as set point may be manually entered.

I. Combination Photocell/Dimming Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)

J. Dual zone option shall be available for Photocell, Dimming Sensors, or Combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.

K. Stand alone Ambient Light Sensors shall interface directly with the 0 to 10 VDC, without any other power source connection, and control dimmable ballasts by sinking up to 20 milliamps of class 2 current. Sensor shall incorporate a photodiode viewing out of a ceiling enclosure at a 30 degree angle from horizontal to detect diffused light from the ambient and artificial sources. Sensor shall allow for removal of response delays for adjustment, however provide dampening delay for normal operation. Settings shall be made manually.

L. Sensors shall be the following Sensor Switch model numbers.

1. CM-PC (Photocell for On/Off)

2. CM-ADC (Dimming Sensor)

3. CM-PC-ADC (Combination Photocell/Dimming Sensor)

4. CM-PC-DZ, CM-ADC-DZ, OR CM-PC-ADC-DZ (Dual Zone Version)

5. CM-ALC (Stand Alone Ambient Light Sensor for Daylight Harvesting)

2.6 LINE VOLTAGE SENSORS

A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack.

B. In areas with clear line of site view of the workspace, sensors shall use PIR detection. In areas with obstructions, sensors shall use PIR/Microphonic detection.

C. Multiple sensors controlling the same load shall be wired in parallel.

D. Wall Mounted Sensors must be installed at 7 to 8 feet above the floor. Single and two circuit units shall be available.

E. High Bay sensors controlling HID Bi-Level must incorporate a Start to High timer on initial power up to provide full light output for up to 20 minutes to prevent shortened lamp life.

F. Specific sensors shall have optional feature for Low Temperature/High Humidity environments.

G. Sensors shall be the following Sensor Switch model numbers.

1. CMR-9 & CMR-9-2P (PIR Ceiling Mount- single and two pole)

2. CMR-PDT & CMR-PDT-2P (PIR/Microphonic Ceiling Mount- single and two pole)

3. CMR-10 & CMR-10-2P (PIR Ceiling Mount Extended Range - single and two pole)

4. CMR-PDT-10 & CMR-PDT-10-2P (PIR/Microphonic Ceiling Mount Extended Range - single and two pole)

5. WVR-16 & WVR-16-2P (PIR Wall Mount single and two pole)

6. WVR-PDT & WVR-PDT-2P (PIR/Microphonic Wall Mount single and two pole)

7. HMR-10 (PIR High Bay Aisle Way)

8. CMR-6 & CMR-6-SH (High Bay Ceiling)

END OF OCCUPANCY SENSORS

DIVISION 28

ELECTRICAL SPECIFICATIONS

PREPARED BY

John Averrett, PE

SECTION 283111

DIGITAL ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install a complete low voltage, automatic and manual fire alarm system as specified herein and indicated on the drawings.

B. The system shall include power supply, signal initiating devices, audible and visual alarm devices, a conduit and wiring system and all necessary accessories required to provide a complete operating system.

C. The system shall comply with the applicable provisions of the National Fire Protection Association Standard Number 72 for fire alarm systems; N.E.C. Article 760; and meet all requirements of the local authorities having jurisdiction.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 010000 Specification Sections, apply to this Section.

1.3 DESCRIPTION OF SYSTEM

A. Conduit, outlet boxes, cabinets, devices and wiring installation for complete fire detection and alarm system. Plenum rated cabling may be installed above accessible ceilings with the approval of the local inspecting authority.

B. Each and every item of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer that is currently listed by Underwriter's Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOBZ as a single control unit. Partial listing shall not be acceptable. System controls shall be UL listed for Power Limited Applications per N.E.C. Article 760. All circuits shall be marked in accordance with N.E.C. 760-23.

C. Wiring shown is diagrammatic to define system and is not intended to show every wire. Review drawings prior to bidding and inform Contractor of any additional wiring necessary for installation of systems. Include cost of all wiring in bid.

D. Submit complete shop drawings of system for review including terminal to terminal connection diagrams for system components and associated equipment interfaces, conduit diagrams, complete descriptive information on each item of equipment including UL listing for all system components, and any other information required by Architect to describe system. Identify color code and terminal numbers on shop drawings.
   1. After completion of work, submit one set of record mylar sepias with items for Owner described above. Typical type drawings will not be accepted.

E. Manufacturer's trained technical representative shall supervise installation, connections and tests. The authority having jurisdiction shall be notified prior to installation or alteration of equipment or wiring. Before acceptance, manufacturer's representative will test and certify in writing that system is

installed and functioning properly as intended by drawings and specifications. Test includes operation of all devices in entire system.

F. The fire alarm system shall have an integrated off premise communications capability using a Digital Alarm Communications Transmitter (DACT) for sending system events to multiple Central Monitoring Station (CMS) receivers. The system shall provide the CMS(S) with point identification of system events using contact ID protocol. The dialer shall have the capability to support up to two (2) individual accounts and to send account information to two (2) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being directed to one or more receivers depending on event type or location as specified by the system designed. In the event of a panel CPU failure during a fire alarm condition, the DACT degraded mode shall transmit a general fire alarm signal to the CMS. Automatic telephone dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless approved by the fire chief. It is the fire alarm contractor's responsibility to coordinate with the owner/architect for transmission paths for the fire alarm control panel (FACP) to be monitored by an approved supervising station in accordance with NFPA72.

G. The Certified Fire Alarm Act is enforced in Georgia. The law requires that every business who installs fire alarm systems in commercial occupancies must be licensed as a Certified Fire Alarm Contractor. The contractor must have a NICET Level III Technician in a position of responsibility, and the license will be issued in the name of the certificate holder and the contractor. The Certified Fire Alarm Act also requires that technicians working for the Certified Contractor must hold a current NICET Level II, or equivalent, certification. Contractors wishing to bid on fire alarm work must show evidence at the pre-bid conference that he/she meets the certification requirements of the Certified Fire Alarm Act and holds a permit issued by the State Fire Marshall.

H. Guarantee entire system in writing for one year from date of acceptance by Owner. Guarantee will cover completely all components, equipment, wiring, etc. Repair any defects found in the system within the guarantee period without cost to owner.

I. Submit with bid a guaranteed price for complete maintenance and service of system for one year beginning at expiration of guarantee period. Price shall be guaranteed for acceptance by Owner until date of substantial completion of system.

1.4 SYSTEM OPERATION

A. Actuation of any alarm initiating device shall cause all audible alarm signals to sound, all visual indicating appliances to flash, cause a red LED on the actuated zone module at the control panel/annunciator to light, provide a signal to the mechanical controls to shut down or re-route air handling systems according to established plans. This shall include a suitable addressable relay at each air handling unit to shut down all air handlers in a given zone when system goes into alarm. In addition, all magnetically held doors shall close automatically.

B. The general alarm devices may be silenced by authorized personnel only, by entering a locked cabinet and operating the proper silencing switch. A subsequent zone alarm shall reactivate the signals. Operation of the silencing switch shall be indicated by a trouble light and audible signal.

C. Operation of any pull station, power failure, opens, grounds, or any disarrangement of the system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble

signal may be silenced; however, the trouble LED shall remain lit until the system has been returned to normal operating condition.

D. Analog Smoke Sensor Operation
   1. The smoke sensor shall be a smoke density measuring device having no self contained alarm set-point. The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to stored values.
   2. The control panel shall maintain a moving average of the sensors smoke chamber value. Systems that do not automatically maintain a constant smoke obscuration sensitivity for each sensor by compensating for environmental factors and are deemed unacceptable.
   3. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "Dirty Sensor" trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location.
      a. If a "Dirty Sensor" is left unattended, and its average value increases to a second predetermined value, an "Excessively Dirty Sensor" trouble condition shall be indicated at the control panel for the individual sensor.
   4. The control panel shall automatically perform a daily self-test on each sensor. Checking the electronics in the sensor's base ensures the accuracy of the values being transmitted to the control panel. A sensor which fails the self-test will cause a "Self Test Abnormal" trouble condition at the control panel. A sensor self-test which must be manually initiated by the operator shall not be acceptable.

1.5 SYSTEM FEATURES

A. The fire alarm system shall include the following features as a minimum:
   1. Supervision of all field wiring.
   2. Microprocessor based solid state modular construction.
   3. 80 character LCD display to indicate alarms, supervisory service conditions and troubles.
   4. Earth ground supervision circuit.
   5. "Dead Front" design control panel/annunciator with field programmable LED alarm, status and trouble indicators, and all control switches located behind a locked tempered glass door.
   6. Alarm LED and trouble LED for each zone.
   7. Simultaneous test of all LED's from a central point.
   8. Fully automatic battery charger and lead alkaline batteries. Batteries shall have capacity to maintain system operation for 24 hours in normal supervisory mode and shall have sufficient capacity remaining to operate in alarm mode for 15 minutes at conclusion of supervisory period. Batteries shall be supervised for connection to the system and for low voltage threshold. Ammeter and voltmeter shall be provided to indicate battery voltage and charging current.
   9. 2 amp form C auxiliary alarm contacts fused with feedback.
   10. 2 amp form C auxiliary trouble contacts.
   11. Up to 64 class A or class B initiating device circuits (zones) capable of handling 50 addressable alarm initiating devices.
   12. Up to 64 two amp alarm indicating circuits.
   13. System shall be field programmable for offsite monitoring by remote station reverse polarity, local energy master box or shunt master box types.
   14. System shall be field programmable for signal circuit type of operation; march time code, temporal code, selective code, zone code, general alarm, time limit cutout and alarm silence inhibit.
   15. Supervised remote annunciator connection circuit.

16. Basic 5 amp power supply (expandable as required).
17. Resident non-volatile programmable operating system memory for all operating requirements.
18. 100 event historical logging.

B. Each zone shall have its own individual alarm indicating light and trouble indicating light.

PART 2 - PRODUCTS

2. 1 FIRE ALARM CONTROL PANELS/ANNUNCIATORS

A. Furnish and install control panels and annunciators as shown on plans.

2.2 ALARM STATIONS - ADDRESSABLE

A. Furnish pull stations as shown on the plans. The station body shall be so constructed that chips and scratches will not expose metal. All stations shall be master keyed with the control equipment. When actuated, the "Pull Lever" shall remain at right angle to the station body until reset.

B. Furnish stations with institutional cover where shown on drawings.

2.3 PHOTOELECTRIC SMOKE SENSOR

A. The addressable smoke sensors shall be of the photoelectric type and shall communicate actual smoke chamber values to the system control panel.

B. The sensors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

C. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in an alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.

D. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

E. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

F. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.

G. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.

H. Provide a U.L. listed sensor guard for sensors in areas subject to tampering. The guard shall be suitable for ceiling or sidewall mounting and hinged for easy access. The guard shall be securely

mounted with tamper-proof screws.

2.4 ADDRESSABLE PHOTOELECTRIC DUCT DETECTOR

A. The detector shall be a non-polarized 24VDC type which is compatible with the Fire Alarm Panel and obtains its operating power from the supervisory current in the fire alarm detection loop. It shall be of the same analog type as the ceiling smoke detectors. Detectors shall be of the solid state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.

B. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector may be reset by actuating the control panel reset switch.

C. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel.

D. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). It shall be possible to alarm the duct housing by using a test switch. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

E. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.

2.5 HEAT DETECTORS

A. Addressable Thermal Sensors: Shall operate on the "fixed temperature" principle with the sensor having a set point of 135 degrees F, the sensor shall contain dual thermistor sensing circuitry for fast response.
B. LEDs: Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. LEDs shall pulse periodically indicating that the sensor is receiving power and communication is being supplied. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. Alarm output shall be available for remote annunciation.
C. Interchangeable Sensors: Each sensor shall be interchangeable via twist lock mounting base. To ensure matching proper sensor to potential hazards of areas being protected, the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

2.6 ALARM SIGNALS (AUDIBLE)

A. The horn shall be polarized and shall be operated by 25VRMS. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall NOT be accepted. Where horns are shown as a combination audio-visual assembly, they shall be mounted as a combination unit in a single back box. Horns shall be capable of producing 88dB and shall be tapped for 2 watt connection.

B. Audio/visual devices required to be surface mounted shall be furnished with surface mounting box and adaptor plate.

2.7 ALARM SIGNALS (VISUALS)

A. Furnish and install visible appliance for fire alarm system notification. The appliance shall be 1HZ synchronized 30 cd with polar distribution or 75 cd illumination as required by the Americans with Disabilities Act (ADA). The appliance shall be U.L. listed to Standard 1971 and have a circumpolar light output allowing mounting in either vertical or horizontal positions or on the ceiling.
   1. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the light pattern in key axis directions.
   2. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8 inches. In its quiescent state, the word "FIRE" shall be visible.
   3. Mounting heights of visual appliances shall in all respects comply with the Americans with Disabilities Act.
   4. Visual indicating appliances shall be comprised of a Xenon flashtube and be entirely solid state. These devices shall be U.L. listed and be capable of either ceiling or wall mounting. The LEXAN lens shall be pyramidal in shape to allow better visibility. Visual units shall be of the standalone type.

2.8 AUXILLARY FUNCTIONS

A. Electromagnetic Door Holders.
   1. Hold fire and smoke barrier doors open until released by alarm.
   2. Holding Power: Approximately 35 pounds (15.9-kg).
   3. Offer fail-safe operation.
   4. Capable of operation on 12 VDC, 24 VAC, 24 VDC, or 120 VAC interchangeably without need of configuration.
   5. Holders: Release through contacts of control panel after alarm has been initiated from any zone. If 120 vac is used for door holders, provide an isolation relay mounted near the door holders to isolate 120 vac from control panel.
   6. Circuits: Separately fused.

2.9 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers:
   1. Simplex
   2. Honeywell Notifier
   3. GE/Edwards EST.

C. All equipment shall be listed by UL. All panels and peripheral devices shall be the standard equipment of a single manufacturer and shall display the manufacturer's name on each component.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor. All junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the installation.

B. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

C. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

D. The manufacturer's authorized representative shall provide on site supervision of installation.

E. The manufacturer’s authorized representative shall have as a minimum, a NICET LEVEL II certification.

3.2 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor.

3.3 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

3.4 CERTIFICATION & ACCEPTANCE

A. A factory trained representative of the manufacturer shall supervise final testing of the system in accordance with N.F.P.A. Standard 72H-1984 in the presence of a representative of the authority having jurisdiction. Manufacturer’s representative shall be NICET trained and shall have a level II NICET certificate. It shall be subject to the approval and acceptance of the responsible engineer. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system.

B. The fire alarm system shall be free from defects in workmanship and materials, under normal use and

service, for a period of one year from the date of acceptance or beneficial occupancy whichever is earlier. Any equipment shown to be defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

C. The equipment manufacturer shall be represented by a service organization, and the name of this organization shall be furnished to the Architect and Owner. The service organization shall be located within 50 miles of the job site. The service organization shall furnish, gratis to the Owner, a one year maintenance warranty contract, effective from the date of final acceptance.

D. Electrical contractor is responsible for insuring the fire alarm system is certified and coordinating with the owner to insure system is being monitored before Life Safety/Final inspections as per the requirements of the State Building Commission. These requirements also mandate the Local Fire Marshall to be in attendance. It is suggested the contractor provide documentation of his efforts to achieve the above.

END OF SECTION 283111

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related work specified elsewhere includes Sections:

.. Section 31 2000 - “Earth Moving”

1.2 SUMMARY

A. This Section includes the following:

1. Protection of existing trees and landscaping to remain, if any, and boundary and property line markers, bench marks, survey control points, and existing structures and improvements which are to remain.

2. Environmental and erosion control measures, as indicated and as otherwise required by applicable codes, regulations, and authorities having jurisdiction.

3. Removal of trees and other vegetation, as indicated, and within “controlled areas.”

4. Topsoil stripping, and stockpiling, as indicated, and within “controlled areas.”

5. Removing above-grade improvements as indicated, and as required to accommodate new construction.

6. Removing below-grade improvements as indicated, and as required to accommodate new construction.

1.3 PROJECT CONDITIONS

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction, unless specifically indicated elsewhere in contract documents.

B. Protection of Existing Improvements:

1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place. Clearing, demolition and any excavation within 5'-0" of existing buildings and structures to remain shall be performed by hand.

2. Protect improvements on adjoining properties and on Owner’s property.

3. Protect boundary and property line markers, bench marks, and survey control points.

4. Restore damaged improvements and markers to their original condition, as acceptable to property owners.

C. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fencing, barricades, and/or other precautions as necessary to protect trees and vegetation to be left standing.

2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.

3. Provide protection for roots over 1-1/2-inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

4. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Architect. Employ a licensed arborist to repair damages to trees and shrubs.

5. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.

PART 2 - PRODUCTS

A. Not applicable to this Section.

PART 3 - EXECUTION

3.1 SITE CLEARING

A. General:

1. Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.

B. Topsoil:

1. Topsoil is defined as friable clay loam surface soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

a. Sift, rake, and/or hand work as required in order to ensure acceptable top soil properties

2. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

   a. Remove heavy growths of grass from areas before stripping.

   b. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

3. Stockpile topsoil in storage piles in areas as indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, as required, to prevent wind erosion, or seed and mulch if left undisturbed for a period of time greater than 14 consecutive days. Contaminated materials cannot be used as fill or stored in portions of the site that contain uncontaminated soil. If contaminated soil is stockpiled it must be properly stored either in covered roll off boxes or on a double layer of thick contractor grade plastic and covered with plastic to prevent rain from washing soils away from stockpiles.

4. Legally dispose of off-site unsuitable soil, excess topsoil not to be stockpiled, and waste material debris. Any excess or unusable material that will be hauled offsite must first be tested for contaminants to determine the proper handling protocol.

5. Fill depressions caused by site clearing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

   a. Place fill material in horizontal layers not exceeding 8 inches loose depth, and thoroughly compact to a density equal to adjacent original ground, unless specific compaction is otherwise indicated in Section 31 2000 “Earth Moving”, or, as directed in the geotechnical investigation.

C. Removal of Improvements:

1. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

3.2 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner’s Property: Burning **will not** be permitted on Owner’s property.

B. Removal from Owner’s Property: Remove waste materials, trash and debris, and legally dispose of same off site.

END OF SECTION

SECTION 312000

EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related work specified elsewhere includes:

.. Section 01 2200 - “Unit Prices”
.. Section 02 3200– “Subsurface Investigation”, “Geotechnical Engineering Report”
.. Section 03 3000 - “Cast-In-Place Concrete”
.. Section 31 1000 - “Site Clearing”,
.. Section 32 1313 - “Concrete Paving”
.. Division 22 - “Plumbing”
.. Division 23 - “Heating, Ventilating, and Air Conditioning”
.. Division 26 - “Electrical”

1.2 SUMMARY

A. This Section includes unclassified excavation, grading and fill as follows:

1. Earthwork for this project is to be bid as Unclassified Excavation.
   a. Finished grades are shown in the plans. Subgrade is the ground surface below finishes such as pavement, building slabs, topsoil etc. Subgrade will be considered the “Cut-line” for this project in areas of cut. All grading work shown in the plans at and above the cut line is unclassified. No additional compensation will be given regardless of whether this material is soil, rock, debris, etc. Grading work below the cut line, except designated undercut areas, will be paid for by change order using the predetermined amounts in the “Unit Prices” for the particular material encountered.

   b. Definitions for soil, rock, etc. are for descriptive purposes related to the handling of material and for additional work.

2. Preparing of subgrade for building slabs, walks, and pavements; and additional work indicated on the Drawings and in the Project Manual.

   a. Comply with recommendations in the Owner’s “Geotechnical Engineering Report”, this Section, and other Division 31 Sections; Refer also to Civil and Structural Drawings for additional information and requirements.

   b. Undercutting of building area as indicated in the Geotechnical Engineering Report and in the Contract Documents.

c. Perform excavation by hand within 5'-0" of existing buildings and structures to remain. Design and provide all necessary supports, shoring, etc., as required to prevent settlement, collapse, and/or other damage to existing buildings and structures to remain.

1) DO NOT EXCAVATE BELOW THE EFFECTIVE BEARING AREA OF FOUNDATIONS OF EXISTING BUILDINGS AND STRUCTURES. In the event of conflict during construction, notify Architect prior to proceeding with work in the effected area.

d. Compaction of backfill at any basement and below grade walls shall only be by hand-directed compaction equipment. Heavy construction equipment and/or heavy trucks shall not be allowed within 10-feet of any basement walls, and within 5-feet of foundation walls.

3. Drainage fill course (porous fill) for support of building slabs is included as part of this work; compacted in place.

4. Excavating and backfilling of trenches within building control areas and on site.

5. Stripping and stockpiling of topsoil (if any) is specified in Section 31 1000 - Site Clearing.

6. The extent of earthwork is indicated on the Drawings. This earthwork is to be included in the base bid as unclassified excavation, regardless of material encountered. All work required in delivering the undercut and rock free zone, as indicated on the drawings, shall also be unclassified and in the base bid.

7. Removal of existing improvements may also be specified under various Division 31 Sections.

B. Excavating and Backfilling for Plumbing, HVAC, and Electrical Work: Refer to Divisions 22, 23, and 26 sections for excavation and backfill required in conjunction with underground mechanical and electrical utilities and buried mechanical and electrical appurtenances, not work of this Section.

1. However, construction materials and execution for Plumbing, HVAC, and Electrical work shall comply with requirements of this Section, and related Division 31 Sections, when the work and/or materials required are not indicated or only partially indicated in Divisions 22, 23, and 26.

C. Placement and compaction of at least 4-inches of topsoil up to finish grades is included in the work of this Section.

1. Allow for thickness of topsoil and sod.

1.3 DEFINITIONS

A. “Excavation” consists of removal of materials and existing improvements encountered to subgrade elevations indicated, and subsequent disposal of materials removed.

B. “Unauthorized” excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner’s Geotechnical Engineer.

Unauthorized excavation, as well as remedial work directed by Owner's Geotechnical Engineer, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Owner's Geotechnical Engineer.

2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner's Geotechnical Engineer.

C. "Additional Excavation": When excavation has reached required subgrade elevations, notify Owner's Geotechnical Engineer, who will make an inspection of conditions. If Owner's Geotechnical Engineer determines that bearing materials at required subgrade elevations are unsuitable, continued excavation may be required. If additional excavation is required, replace excavated material as directed by Owner's Geotechnical Engineer.

1. The Contract Sum will be adjusted by Change Order, or as provided in General Conditions, for additional excavation and its replacement appropriately authorized in writing prior to beginning the work, and for which the Contractor is due payment from the Owner.

D. "Subgrade": The undisturbed earth or the compacted soil layer immediately below pavement base course, select drainage fill, bottom of indicated undercut areas, or topsoil materials.

E. "Structure": Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

F. "Building Control Area" and/or "Controlled Area": Below and at least 10-feet beyond building foot print or exterior walls, and below roofs, to include covered porches and canopies, and below and at least 5-feet beyond all walks and pavements subject to bearing vehicular traffic.

G. "Mud Footings" (if any): The at least 2-inches to 4-inches of lean 2,500 psi (minimum) concrete placed in the bottom of footing and foundation trenches and excavations, which is required if permanent or structural concrete cannot be placed the same day they are excavated.

1. Unless mud footings are indicated on Structural Drawings, their depth shall be compensated for by over-excavation.

2. Mud footings (if any) shall be completely clean prior to placement of any reinforcing and/or permanent or structural concrete.

3. Refer to the Owner's "Geotechnical Engineering Report", and Structural Drawings for additional information and requirements for other "mud footings" (or "mud mats", or "mud seals").

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock

excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 19,000 lbf; measured according to SAE J-1179.

2. Bulk Excavation: Late-model, track-mounted dozer equipped with a single tooth ripper; rated at not less than 250-hp flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

3. Refer to “Owner’s Geotechnical Engineering Report” for additional information regarding recommendations when rock is encountered.

1.4 SUBMITTALS

A. Test Reports: Submit the following reports directly to Architect, Civil Engineer, Structural Engineer, and the Owner, directly from the testing service, with copy to Contractor:

1. Test reports on fill and borrow material.

2. Verification of suitability of each foundation, floor slab and subgrade condition and material, in accordance with specified requirements.

3. Field reports; and in-place soil density tests.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work on site and in right-of-ways in compliance with applicable requirements of authorities having jurisdiction.

B. Testing and Inspection Service: All required soil testing and inspection services during earthwork operations shall be performed by a qualified independent geotechnical testing laboratory.

1. Refer to Section 01 0150 - “Special Conditions”, for additional information and requirements.

1.6 PROJECT CONDITIONS

A. Site Information: Refer to Section 31 1000 - “Site Clearing”, the Owner’s “Geotechnical Engineering Report”, and Civil Drawings, for additional information and recommendations.

The site was explored by drilling a total of eleven (11) SPT borings to depths of about 5 to 30 feet below existing grade.

Initially, most borings encountered existing fill to depths of approximately 3 to greater than 5 feet. While not encountered in our borings, organic laden material (OLM) will likely be encountered. It should be noted that OLM could vary across the site especially due to the

larger trees found on site, along steep slopes, and in the low-lying drainage areas. Below the fill, the borings encountered mostly sandy silts and silty sands with layers of sandy lean and fat clays. Refusal to soil drilling methods was not encountered in any of the borings. The SPT N-values ranged from 4 to 50+ blows per foot in the native soils.

Groundwater was encountered in borings B-1, B-2, B-3, B-4 and B-5 at depths of 12 to 19 feet below existing grades. Groundwater was not encountered in any of the other borings.

Marginal consistency (N ≤ 8 bpf) fill material was encountered in the upper 3 feet in two (B-2 and B-5) of the building borings. Boring B-2 is in a fill area, the marginal material may need to be undercut, depending on the results of a proofroll at the time of construction, prior to placement of fill. B-5 is roughly at grade and may require undercutting to provide foundation support. We recommend that an allowance be carried in the project to undercut and replace up to half of the building area 3 feet.

Most of the on-site soils can be reused as compacted fill. Moisture conditioning of the soils will likely be required to achieve the recommended compaction requirements.

The seismic site class for this site is “D”.

Conventional shallow foundations bearing in the existing lean clay or newly placed compacted fill should be sized for a net allowable bearing capacity of 1,500 pounds per square foot (psf).

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations in the vicinity, and as may also be required for other construction work.

1. Notify Georgia 811 at least 2-full working days (48 hours), excluding weekends and holidays, prior to any excavation work. This organization will contact its member utility companies to locate and mark all of their own underground facilities.

    a. Notify non-member companies directly, for them to perform this service.

2. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions and record locations on as-built record drawings. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

3. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

    a. Provide minimum of 48-hour notice to Owner and copy Architect and receive written notice to proceed before interrupting any utility.

4. Demolish and completely remove from the site any existing underground utilities to be removed, and all existing underground utilities in “controlled areas”. Coordinate with utility companies for shutoff of services if lines are active.

C. Use of Explosives: Use of explosives *is not* permitted.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Comply with requirements of current regulations of OSHA, applicable Codes, ordinances, and authorities having jurisdiction.

4. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

5. Perform excavation by hand within 5'-0" of existing buildings and structures to remain, and within dripline of large trees to remain. Protect root systems from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap. Paint root cuts of 1-inch and larger with emulsified asphalt tree paint.

a. Do not under-mine or excavate below footings and/or foundations which are to remain.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS - DEFINITIONS

A. Satisfactory soil materials are defined as clean, non-saturated, non-organic sections of earth taken from acceptable sources with particle size no larger than 3 inches complying with ASTM D2487 soil classification groups included in recommendations of the Owner's "Geotechnical Engineering Report", or if not included, as directed at the time of earthwork operations and/or acceptance resulting from acceptable test results obtained on soil materials proposed by the Contractor and tested by the project Geotechnical Engineer, as required by the Bid and Contract Documents.

Location	Test Method	Compaction Required (Min)	Moisture Content
Structural Areas, Fill Slopes, Pavement Areas and 5' beyond perimeter	ASTM D698	98%	-/+3 percentage points of optimum moisture
Upper 12 inches of subgrade in Pavement Areas and 5' beyond back of curb line	ASTM D698	98%	-/+3 percentage points of optimum moisture
Utility Trenches	ASTM D698	95%	-/+3 percentage points of optimum moisture

Structural Fill Material should meet the following Characteristics:

Property	Requirement
Organic Material	≤ 5%
Liquid Limit	< 50%
Plasticity Index	≤ 25%
Maximum Dry Density	≥ 100 lb/ft3
Maximum Particle Size	3 inches or less

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups other than those indicated above and as indicated in the Owner's "Geotechnical Engineering Report".

C. Drainage Fill (or "porous fill" or "drainage aggregate"): Clean, washed, evenly graded mixture of free-draining pea gravel, coarse sand, or crushed stone, with not more than 50 percent passing a No. 50 sieve and not more than 5 percent passing a No. 200 sieve, and subject to approval by the project geotechnical engineer and testing laboratory; Minimum 4-inches compacted completed thickness.

D. Backfill and Fill Materials (Grassed areas only; Cuts and fills outside "controlled areas", during general grading): Satisfactory soil materials from on-site excavations, free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious material.

1. All fill soils must be compatible with existing soils, so they can bond together.

E. Topsoil: Refer to Section 31 1000 - "Site Clearing." for suitable topsoil definition.

F. Rock Fill: Refer to Geotechnical Report for recommendations regarding placement and compaction requirements.

PART 3 - EXECUTION

3.1 PROOFROLLING

A. Areas throughout significant slopes and beneath and 10'-0" beyond new building and covered areas, and beneath and 5'-0" beyond new pavement areas (back-of-curb or other paving edge termination) shall be designated as "controlled areas." Prior to fill placement on the subgrade, the proposed building and pavement areas should be densified with a heavy-duty static roller to achieve a uniform subgrade. The subgrade underneath the building and the pavement should be thoroughly proofrolled after the completion of densification. Proofrolling will help detect any isolated soft or loose areas that "pump", deflect or rut excessively, and also densify the near-surface soils for floor slab support. The exposed subgrade must be well drained to prevent the accumulation of water. A loaded tandem axle dump truck capable of transferring a load in excess of 20 tons should be utilized for this operation. Proofrolling should be performed under the Geotechnical Engineer's observation. Areas where pumping, excessive deflection or rutting is observed after successive passes of the proofrolling equipment should be undercut, backfilled and then properly compacted. It is anticipated that some amount of subgrade undercutting may be required under the footings during subgrade preparation. If any areas fail the proofroll, repair these areas as directed by the Owner's Geotechnical Engineer.

1. Proofrolling shall be conducted in the presence of testing lab's Geotechnical Engineer.

2. Prior to fill placement on the subgrade, the proposed building and pavement areas should be densified with a heavy-duty static roller to achieve a uniform subgrade. The subgrade underneath the building and the pavement should be thoroughly proofrolled after the completion of densification.

3. Do not proofroll when the ground surface is wet or saturated with water.

3.2 EXCAVATION

A. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as structures, foundations, rock or unauthorized excavation.

B. The Contractor is responsible for performing his/her own quantity take-off. However, do not assume that the cut to fill quantities on this site balance. Excess material that is suitable for use as structural fill may be placed on site as directed. This material is to be placed and compacted as structural fill.

C. Material not suitable for reuse is not to be placed in the structural fill mass and is to be discarded, hauled off site and legally disposed of.

D. Soft, wet unsuitable soil is expected in low areas. Undercut these areas as directed by the Owner's Geotechnical Engineer. This material may be suitable for re-use in certain areas if properly moisture conditioned. This will be determined by the Owner's Geotechnical Engineer during construction

E. Refer to "Definitions" paragraph above for any "mud footings" required.

F. Perform excavation by hand within 5'-0" of existing buildings and structures to remain.

1. Do not under-mine or excavate below footings and/or foundations which are to remain.

3.3 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.4 DEWATERING

A. Prevent surface water and Geotechnical or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Contractor to provide and maintain, at their expense, pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

3. The water table should be maintained at least two feet below the bottom of excavations.

4. Pumping equipment should be prepared if the above ditch system cannot effectively drain water away from the site, especially during the rainy season.

3.5 STORAGE OF EXCAVATED MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations.

1. Excess soil material may be placed on site as directed by the Owner or Architect. Place in a controlled manner, compacted in lifts as structured fill. Stabilize area with appropriate erosion control measures. Place 4 inches of topsoil, seed and mulch when complete.

3.6 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus, a sufficient distance to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3. For areas within the “Building Controlled Area”, excavate, scarify, moisture condition and recompact existing material as acceptable to the Geotechnical Engineer. If compaction requirements cannot be satisfied by recompacting existing material then remove the existing material and replace it with structural fill acceptable to the Geotechnical Engineer.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

1. In pavement areas and 5 feet beyond that are in cut, excavate in place material to a depth of 2 feet below pavement subgrade. In areas which are at or above the finished grade, and which will support pavements or slabs, the upper 2 feet immediately below these systems should be scarified and recompacted to the criteria recommended in the Owner’s “Geotechnical Engineering Report”. If compaction requirements cannot be satisfied by recompacting existing material then remove the existing material and replace it with structural fill acceptable to the Geotechnical Engineer.

3.8 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6-inches to 9-inches of clearance on both sides of pipe or conduit.

B. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on minimum of 4-inches of compacted “select fill” bedding. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

C. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage, etc.) so top of piping is not less than 3'-0" below finished grade and/or paving.

D. Where rock or concrete is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of dense graded crushed stone, prior to installation of pipe.

3.9 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.10 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under all areas, use satisfactory excavated or borrow material. Refer to Owner’s “Geotechnical Engineering Report”, and this Section, for minimum testing requirements.

2. Under building slabs, use drainage fill material of compacted and finished depth indicated, or if not indicated, at least 4-inches compacted and completed thickness.

3. Within pavement areas, place and compact acceptable structured fill to a depth of 2 feet (minimum) below the future pavement subgrade elevation as directed by the Owner's Geotechnical Engineer

4. Backfill trenches with concrete where trench excavations pass within 18-inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

   a. Concrete is specified in Division 3.

   b. Do not backfill trenches until inspections and any required testing have been made and backfilling is authorized by Architect based on test results. Use care in backfilling to avoid damage or displacement of pipe systems.

   c. Utility trenches shall be backfilled with acceptable borrow or dense graded aggregate in 3" to 4" loose lifts compacted with mechanical piston tampers to the project requirements. Open graded stone is not to be used as backfill.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, etc.

2. Inspections, testing, approval, and recording locations of underground utilities have been performed and recorded.

3. Removal of concrete formwork, if any.

4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.

   a. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities or leave in place if required.

5. Removal of trash and debris from excavation.

6. Permanent or temporary horizontal bracing is in place on horizontally supported walls, where necessary.

3.11 PLACEMENT AND COMPACTION - GENERAL

A. Ground Surface Preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip or break up sloped surfaces steeper than 1-vertical to 4-horizontal so that fill material will bond with existing surface.

2. Prior to placement of fill earth and following removal of cut earth, the controlled areas shall be proofrolled. Areas to be filled shall be proofrolled prior to any fill

placement; cut areas shall be proofrolled after they are brought to subgrade level. Proofrolling shall be performed with a fully loaded tandem axle dump truck (20 tons) or similarly weighted construction equipment. The proofroller shall make at least two passes over each section in perpendicular directions over the “controlled areas”. Soft, organic, or excessively wet soils found during the proofrolling operations shall be excavated and replaced with suitable compacted fill. The exposed subgrade must be well drained to prevent the accumulation of water. If any areas fail the proofroll, repair these areas as directed by the Owner’s Geotechnical Engineer.

a. Proofrolling shall be conducted in the presence of testing lab’s Geotechnical Engineer.

b. Do not proofroll when the ground surface is wet or saturated with water.

B. Place backfill and fill materials in layers not more than 8 to 10 inches or less in loose thickness when heavy, self-propelled compaction equipment is used and 4 to 6 inches in loose thickness when hand-guided equipment (i.e., jumping jack or plate compactor) is used.

B. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

C. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

D. General Fill Embankment Construction

1. Embankment construction shall commence at the toe of the proposed slope and continue upwards as additional fill is placed. The engineered fill placed shall be benched into the natural slopes.

2. The embankment is to be overfilled and then cut back to the required geometry to remove the uncompacted material that is usually present on the face of fill slopes.

3. The face of slopes shall be promptly vegetated according to the Erosion Control Plan, the CBMPP and Section 31 2500 Erosion and Sedimentation Control to prevent erosion after construction. Prior to vegetation 4” minimum topsoil is to be placed and tracked in by a dozer moving up and down the slope to create horizontal track lines.

E. Rock fill:

1. Rock Fill is not to be used unless acceptable to the Owner’s Geotechnical Engineer. Break larger particles down to 6 inches or less and treat as soil fill.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Owner's Geotechnical Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D1557 :

a. Under structures, building foundations and slabs, and 10' beyond those perimeters, compact full depth of fill placement to at least 95% modified proctor maximum dry density in accordance with the recommendations made in the Owner's "Geotechnical Engineering Report".

1) Cut areas shall be proof rolled prior to and during scarification efforts and observed by the Owner's Geotechnical Engineer.

b. Under steps, covered areas, sidewalks, mechanical/utility and in all other "controlled areas", compact full depth of fill placement and scarify, moisture condition, and re-compact the top 24" in cut areas to at least 95% modified proctor maximum dry density

c. Under pavements and at least 5-feet beyond (measured from back-of-curb or edge of paving, where occurs), remove loose soils as described in this section and replace with suitable material that is compacted to 95% modified proctor maximum dry density.

d. Under lawn or unpaved areas beyond "controlled areas", compact each layer of backfill or fill material in accordance with the recommendations made in the Owner's "Geotechnical Engineering Report".

e. On-site Borrow (where allowed): 95-percent modified proctor maximum dry density and in accordance with the recommendations made in the Owner's "Geotechnical Engineering Report".

f. Select and/or Structural Fill: In accordance with the recommendations made in the Owner's "Geotechnical Engineering Report".

g. Porous Fill (drainage course): In accordance with the recommendations made in the Owner's "Geotechnical Engineering Report".

2. Moisture Control:

a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

b. Remove and replace, or scarify and moisture condition, soil material that is too wet to permit compaction to specified density.

c. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist moisture conditioning by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

d. At the time of densification, the moisture content of "engineered fill", "structural fill", and "select fill" should be within -3% to +3% of the materials' ASTM D-1557 optimum moisture content.

e. Structural fill areas exposed to excessive wetting, drying or otherwise disturbed by the construction following acceptance for moisture and density should be retested followed by the correction of deficient areas just prior to the installation of additional fill or structures.

f. In no instance should placement of structural fill or ground supported structures be permitted if the ground surface soils contain a moisture content in excess of 3% of the material's optimum moisture content.

g. In no case shall porous drainage backfill (except as specifically approved by the Geotechnical Engineer) or masonry sand material be used adjacent to foundations. Care shall be taken to prevent masonry brick/block debris from falling or being pushed into foundation excavations.

3.12 GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10-foot above-or-below required subgrade elevations.

2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10-foot above-or-below required subgrade elevation.

3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation.

4. Connection of Existing and New Work: Provide flush transition, unless specifically indicated otherwise.

C. Grading Surface of Fill under Building Slabs and "Building Control Areas": Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.

D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.13 BUILDING SLAB DRAINAGE COURSE

A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs, sidewalks, pads, and below canopies and covered porches, and elsewhere as indicated.

1. Minimum Completed Thickness: 4-inches of free-draining (less than 5% passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 95% of ASTM D1557

B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. When a compacted drainage course is indicated to be 6-inches thick or less, place material in a single layer. When indicated to be more than 6-inches thick, place material in equal layers, except no single layer more than 6-inches or less than 3-inches in thickness when compacted.

3.14 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction:

1. Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

2. Perform field density tests in accordance with ASTM D 1557 (dynamic cone penetration testing and hand auger borings), or acceptable ASTM methods or nuclear testing method, as applicable.

3. New Footing Subgrade: All foundation excavations shall be observed by the Project Geotechnical Engineer or his representative to verify required design bearing capacities of the bearing soils.

4. New Paved Areas, New Building Slab and “Building Control Areas” Subgrade: Perform at least one field density test of subgrade for every 5,000-square feet of fill area for each foot of vertical thickness of fill placed in “controlled areas”, with a minimum of one (1) test per lift.

5. Foundation Wall Backfill: Perform at least 2-field density tests at locations and elevations as directed.

6. Trenches: Perform at least one field density test for every 50-linear feet for each 8 inches of vertical thickness of fill placed in utility or similar trenches, which extend through the “controlled areas”.

a. Retaining walls, if any, same as for “Trenches”, as indicated above.

7. A laboratory soil particle size, Atterberg limit, and Proctor moisture density relationship test shall be performed on each different type of fill soil used in the “controlled areas”.

8. Based on the Project Geotechnical Engineer’s testing reports, inspections, and recommendations, subgrade or fills that are below specified density, additional earthwork, compaction, and/or other operations, and re-testing, shall be performed until specified density is obtained.

3.15 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction and per drawings.

3.16 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Repair edges of existing pavements, sidewalks, etc., and other existing and/or new improvements flush with and to match existing materials and thicknesses, subject to acceptance by Owner and Architect.

D. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

E. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property:

1. Remove excess and waste materials, including unacceptable excavated material, trash, debris, and waste materials, and legally dispose of off Owner's property.

END OF SECTION

SECTION 312500

EROSION AND SEDIMENTATION CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. This section covers the installation and maintenance of erosion control measures for the project.

B. All necessary precautions to prevent erosion and siltation, as required by the Georgia Environmental Protection Division (GA EPD) storm water permit, shall be followed, including sediment barriers, silt fences, and other items as required by the Construction Stormwater General Permit.

C. The CONTRACTOR shall maintain all erosion and sediment control measures installed on a regular basis. The CONTRACTOR shall repair or replace damaged measures at the direction of the ENGINEER at no additional cost to the OWNER.

D. All stormwater field materials, appurtenances, and labor shall be included in the price bid, separately from the allowance herein for Stormwater. Contractor shall include all costs associated with products used to implement and maintain the Erosion and Sediment Control Plan in his bid. Additional monies will not be allocated to the contractor by the OWNER for erosion and sediment control measures. If an allowance is included in the bid price, and the Contractor expects costs to be greater than the amount set forth in the allowance, the Contractor shall place these additional costs in his bid.

1.2 RELATED DOCUMENTS

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

1. Section 31 1000 - Site Clearing
2. Section 31 2000 – Earth Moving
3. Georgia Environmental Protection Division (GA EPD) Stormwater Permit Requirements
    A. Georgia Manual for Erosion and Sediment Control in Georgia, latest edition
4. Erosion and Sediment Control Plan(s)

1.3 ENVIRONMENTAL REQUIREMENTS

A. The Contractor shall protect adjacent properties and water resources from erosion and sediment damage throughout the life of the contract.

1. The Contractor shall be responsible for the removal of sediments and debris escaping the project site, the remediation and/or repair of any damage that may occur as a result to adjoining and/or downstream affected properties or offsite structures and any fines or penalties levied against the project by regulatory agencies due to deficiencies of control measures.

B The Contractor will designate, by name, a Qualified Credentialed Professional (QCP) or equivalent person responsible for monitoring of all erosion control measures for this project. Specific responsibilities will include:

1. Assuring and certifying the Contractor's construction sequence is in conformance with the specified schedule. In addition, a weekly certification stating compliance, any deviations, and corrective measures shall be filed with the Owners by this person.

2. Inspection of all erosion control measures and drainage inlets within 24-hours after any significant rainfall. A significant rainfall shall be defined as over 3/4 inch of precipitation in any consecutive 24-hour period.

3. Inspect areas for catch of grass. A minimum catch of 75 percent is required prior to warrant removal of erosion control measures.

4. Transfer the NPDES permit, which was obtained by the Owner, from the Owner's name to the Contractor's name. All fees associated with the transfer, correspondence with the Local Issuing authority (LIA) and inspections as part of the maintenance of the permit are the responsibility of the contractor.

C. Other than the land clearing activities required to install the appropriate erosion and sediment control measure in accordance with the erosion and sediment control plans, any down slope erosion and sediment control measures, on-site stream channel protection and upslope diversion of drainage required by site conditions, shall be in place and functional before any clearing or earth moving operations begin and shall be constructed and maintained throughout the construction period.

1. Temporary measures may be removed at the beginning of the workday but shall be replaced at the end of the workday.

D. The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. Any slope or fill which has been graded shall, within thirteen (13) days of the completion of such grading or the completion of any phase of grading, be planted or otherwise be provided with ground cover, materials, devices, or structures sufficient to retain erosion. The devices, structures, and measures shall remain in place until the graded slope or fill is stabilized.

E. All hazardous substances used for this project shall be stored in accordance with current Spill Prevention Control and Countermeasures (SPCC) regulations.

1. Store substances away from storm drains, ditches, and gutters in water-tight containers.
2. Dispose of substances in accordance with GEPD/EPD regulations.
3. Provide adequate trash containers on-site for the disposal of material waste.
4. Prevent trash and debris from entering storm drainage system.

F. All construction materials shall be properly stored, not exposed to rain, and stockpiled. All containers shall be stored closed or under cover. All excess or waste material shall be disposed of properly.

1. Provide a construction waste dumpster or trailer on-site for disposal of construction waste.
2. Dispose of trash and waste to an acceptable offsite facility every week at a minimum.
3. Prevent trash and debris from entering storm drainage system.

G. There shall be no distinctly visible floating scum, oil, or other matter contained in the storm water discharge to a receiving water, must not cause an unnatural color (except dyes or other substances discharged for the purpose of environmental studies and which do not have a harmful effect on the receiving water) or odor in the receiving waters. The storm water discharge to receiving water must result in no material in concentration sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving water.

1. Ensure all materials are handled appropriately.

2. No pollutants are allowed to be disposed of on-site or allowed to enter the storm drainage system.

H. Upon completion of the land disturbing activity and stable vegetation or other permanent controls have been established on all remaining exposed soil, the Contractor shall notify the Owner of this and request a final inspection.

1. The Owner, or his authorized agent, will inspect the site within 5 working days after receipt of notice.

I. The Contractor shall prevent the tracking of mud and debris onto paved roadways from construction areas.

1. Provide a construction exit pad in accordance with the erosion and sediment control plans and in accordance with the approved installation procedures and maintain it on a daily basis.

a. Provide a spray hose for the washing of tires and equipment
b. Rework or supplement the construction exit pad stone as required to ensure its continued effectiveness throughout the duration of the construction period.

2. Remove any sediments tracked offsite or deposited on the adjacent roadways.

a. Utilize a mechanically operated street sweeper to remove any mud and sediment deposited on the adjacent roadways.

J. The Contractor shall be responsible for keeping dust to a minimum through the use of water trucks or other dust controlling methods throughout the construction duration.

PART 2 - PRODUCTS

2.1 BEST MANAGEMENT PRACTICES

A. The vegetative measures and structural practices shall be in accordance with chapter six of the "Manual for Erosion and Sediment Control in Georgia" as currently amended.

2.2 MATERIALS

A. Quick growing grasses for temporary seeding (see seed mixes contained in CBMPP and in Plans).

B. Fencing for siltation control as specified on the plans.

C. Temporary mulches such as loose hay, straw, netting, wood cellulose or agricultural silage.

D. Stone check dams shall be spaced according to the Plans.

E. Stone Sediment Barriers or SiltSacks ™ , or approved equal for inlet protection.

F. High Density Poly-Ethylene (HDPE) Filters or Silt-Saver™, or approved equal for inlet protection.

G. A stabilized construction entrance shall be constructed temporarily.

H. Riprap for slopes, culvert, storm drain inlet, and outlet aprons.

I. Water for dust control.

J. Wattle check dams shall be spaced according to plans.

K. Erosion control blankets and/or turf reinforcement mats to protect seed and prevent erosion on slopes.

a. All mats and blankets (ECB's) shall conform to the Georgia Manual for Erosion and Sediment Control in Georgia, latest edition for the slope specified in the construction plans.

PART 3 – EXECUTION

3.1 PREPARATION

A. Review site erosion and sediment control plan attached to this section of the specifications.

B. Deficiencies or changes in the erosion control plan as it is applied to current conditions will be brought to the attention of the Engineer for remedial action.

3.2 IMPLEMENTATION

A. Provide catalog cuts and information concerning the erosion control products which will be used for construction for review by the Engineer.

B. Provide information concerning the installation of the erosion and sedimentation control including anchorage trench provisions and anchorage devices and spacing for review by the Engineer.

C. Provide construction exit pad in accordance with the erosion and sediment control plan and in accordance with the approved installation procedures.

D. Place erosion control systems in accordance with the erosion and sediment control plan and in accordance with approved installation procedures.

E. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations. The Owner has the authority to direct the Contractor to provide immediate permanent or temporary pollution control measures. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical.

F. The temporary erosion control systems installed by the Contractor shall be maintained as directed by the Engineer to control siltation at all times during the life of the Contract. The Contractor must respond to any maintenance or additional work ordered by the Engineer within a 48-hour period.

G. Any additional material work required beyond the extent of the erosion control plan shall be paid for by the Owner except where such measures are required to correct deficiencies caused by the failure of the Contractor to construct the work in accordance with the erosion and sediment control plan.

H. Slopes that erode easily shall be temporarily seeded as the work progresses according to the GA EPD seeding schedule or according to the seeding schedule contained in the plans.

I. Remove and properly dispose of accumulated silt and sediment from all erosion control measures on a daily basis off site unless material is reusable.

J. Remove and properly dispose of all trash and sediments accumulated in existing and new storm drainage inlets, structures, and pipes on a daily basis off site unless material is reusable.

K. Provide temporary diversion berms and ditches as required during construction to protect work areas from up-slope runoff and/or to divert sediment-laden water to appropriate sediment control devices, traps, or stabilized outlets.

L. Provide water trucks or other adequate method for controlling dust throughout the construction period.

M. Channel Stabilization - Where necessary, all trees, brush, stumps, and other

objectionable materials shall be removed so they will not interfere with the construction or proper functioning of the channel. Trees and their root system should be left intact where possible.

3.3 INSPECTION AND MAINTENANCE

A. It is the CONTRACTOR'S responsibility to perform all required inspections in accordance with all Authorities having Jurisdiction.

B. The CONTRACTOR is responsible for continually maintaining all temporary erosion control measures until permanent measures are properly installed and performing as required.

END OF SECTION

SECTION 313100
SOIL TREATMENT

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: Soil treatment.

B. Related Sections:
1. Division 6 Section "Miscellaneous Rough Carpentry" for wood preservative treatment by pressure process.
2. Division 31 Section " Earth Moving."

1.3 SUBMITTALS

A. Product Data: Submit for treatment product indicating material descriptions. Include application instructions and EPA-Registered Label for termiticide products.

B. Qualification Data: Submit for qualified Installer to demonstrate their capabilities and experience; include documentation indicating compliance with specified qualification requirements. (Submit for Architect's information only.)

C. Product Certificates: Submit for each type of termite control product signed by manufacturer certifying that treatments furnished comply with specified requirements. (Submit for Architect's information only.)

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and 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.

E. Closeout Submittals: Submit the following with contract closeout documents.
1. Executed warranty specified in this Section.
2. Proposal for continuing maintenance service.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is locate and who is experienced with the application of termiticide used for the Project with a record of successful in-service performance.

B. Regulatory Requirements: Termiticide shall bear label with Federal registration number indicating compliance with EPA regulations and authorities having jurisdiction.

C. Source Limitations: Obtain termite control products from a single source and from a single manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Coordination:
   1. Coordinate soil treatment application with excavating, filling, grading, and concreting operations.
   2. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 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.
   1. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   2. Warranty Period: Five (5) years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

A. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded.
   1. State services, obligations, conditions, and terms for agreement period and for future renewal options.
   2. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.
   3. Agreement shall include retreatment for occurrences of termite activity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers; subject to compliance with requirements, provide products by one of the following:
   1. BASF Corporation, Pest Control Solutions.
   2. Bayer Environmental Science / Div. Bayer CropScience, LP.
   3. Ensystex, Inc.
   4. FMC Corporation, Agricultural Products Group.
   5. Syngenta.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.
   1. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.
   2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s).

B. 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.

C. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

D. Hose Connection: Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 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: Under 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 and piers; and along the entire outside perimeter, from grade to bottom of footing.
3. Masonry: Treat voids.
4. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

C. Post signs in areas of application, warning that poison has been applied. Remove signs before treated areas are covered by other construction.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

END OF SOIL TREATMENT

SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related work described elsewhere includes:

.. Section 31 2000 - “Earth Moving”
.. Section 32 1313 - “Concrete Paving”
.. Section 32 1613 - “Curbs and Gutters”

1.2 DESCRIPTION OF WORK

A. Work described in this section includes new bituminous paving, a new base, and otherwise as indicated on drawings. In the event of conflict between this Section and Drawings, the more stringent requirements shall be provided.

B. Work shall also include pavement patching for any utility trenches under existing paving and this Contract, with prepared subgrade, 8" base material, 6-inch thick 3,000 psi concrete, prime coat, and 2 inches bituminous concrete overlay, and as indicated on the Drawings.

1. Pavement patch shall extend 9" to 1'-0" beyond each side or edge of trench, and to abut flush with edge where existing paving was cut out.

1.3 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of bituminous materials and other manufactured items, certifying that these products comply with specifications and standards listed hereinafter.

1. All asphalt used for pavement shall be produced by a plant certified by the Georgia Department of Transportation (GDOT).

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the “GDOT Standard Specifications Construction of Transportation Systems”, latest edition.

C. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by an independent testing laboratory. Refer to Section 01 0150 - “Special Conditions,” for additional information.

1.4 JOB CONDITIONS

A. Any base or sub-base areas damaged by weather or construction operations shall be scarified, remixed and recompacted in accordance with requirements before application of the prime coat.

B. Special care and attention shall be given to be certain that paving operations and/or equipment do not cause damage to any existing and/or new buildings, structures, or improvements which are to remain.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide the paving system(s) indicated on the Drawings, installed in accordance with Part 3 of this Section, as per Georgia Department of Transportation and referenced standards.

PART 3 - EXECUTION

3.1 PRIME COAT

A. Application rates and construction requirements shall be as specified in GDOT Standard Specifications for Asphalt Cement.

3.2 TACK COAT

A. Construction requirements, including preparation of the existing surface or substrate and maximum application rates, are as specified in GDOT Standard Specifications.

3.3 PLANT MIX BITUMINOUS CONCRETE BINDER LAYER AND BITUMINOUS CONCRETE WEARING SURFACE

A. Construction details, including finished surface tolerance, density requirements, and maintenance and protection shall be as specified in GDOT Standard Specifications. Rate of application shall be not less than the number of pounds per square yard for a 1-inch wearing surface or pavement patching layer, pro-rated for other thicknesses, as indicated, or if not indicated as required by the GDOT Standard Specifications.

3.4 GRADED AGGREGATE BASE

A. Construction requirements shall comply with requirements shall comply with the GDOT Standard Specifications for the materials indicated; compacted in accordance with the recommendations made in the geotechnical investigation.

3.5 COMPACTION EQUIPMENT

A. Compaction equipment shall be self-propelled, capable of compacting the mixture throughout the depth of the layer while it is still in a workable condition without damage to the material.

1. Self-propelled rollers shall have a minimum weight of 10 tons.

3.6 PAVEMENT PATCH

A. Saw cut perimeter of existing paving to a neat straight line where removal is indicated and/or required.

1. Protect edges of paving and base exposed to prevent cracking, breaking-up, wash-out, erosion, and/or other damage; apply prime coat as specified and at all such vertical edges prior to placing new pavement.

B. Patch pavement with components stated in Paragraph 1.2-B above, in compliance with each component's specified requirements, and as per details and sections on Drawings, if any.

END OF SECTION

SECTION 321313

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 312000 - “Earth Moving”
2. Section 033000 - “Cast-In-Place Concrete”
3. Section 079200 - “Joint Sealants”

1.2 DESCRIPTION OF WORK:

A. Extent of portland cement concrete paving is shown on drawings, including exterior walks, paving, entry pads, dumpster pads and any similar new work indicated. Finished appearance of new walks and paving shall be as indicated, and flush with and generally to match adjacent similar existing installations.

1. The work shall include verification of existing subgrades where new concrete is to be poured; to include in part, compacted stone base and modified roadbed at vehicular paving, compacted stone base at sidewalks, and select fill where necessary to supplement depth and/or soundness of existing subgrades, and all related work.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with “Georgia Department Transportation Standard Specifications Construction of Transportation Systems”, (GDOT) latest edition, and local governing regulations if more stringent than herein specified.

B. Testing: All laboratory and field testing required to ensure compliance with these specifications will be performed by a qualified independent testing laboratory.

C. Flooring/Walkway Products: Products and installation, surfaces’ co-efficient of friction (slip-resistance), etc., under the work of this Section shall be in compliance with the more stringent of applicable provisions of the following; and revisions and amendments thereto:

1. Americans With Disabilities Act of 1990 (ADA) “Accessibility Guidelines” (ADA-AG).
2. “2010 ADA Standards for Accessible Design”, Published in the Federal Register September 15, 2010.
3. American National Standards Institute (ANSI), ANSI A 117.1, 2009.
4. “Uniform Federal Accessibility Standards” (UFAS);
5. International Building Code, either the latest edition or latest adopted edition of the locality as applicable at the project locale.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Forms:

1. Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
2. Use flexible spring steel forms or laminated boards to form radius bends as required.
3. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh:

1. Welded plain cold-drawn steel wire fabric, ASTM A 185.

a. Size: 6” x 6” W1.4 / W1.4 (6x6 10/10) at sidewalks, pedestrian only traffic areas and mechanical pads, and 6” x 6” W2.9 /W2.9 (6x6 6/6) at any vehicular paving areas and dumpster pads, unless heavier mesh is indicated on the Drawings.

2. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect, for all concrete paving subject to possibility of bearing the weight of vehicular traffic.
3. Furnish in rolls or flat sheets for all concrete paving accessible only to pedestrian traffic, unless indicated otherwise on civil or structural drawings.
4. Locations for Use: All concrete pads and paving, at 1/3 of total depth of concrete from top of slab.

C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40 or 60.

D. Concrete Materials: Comply with requirements of 033000 - “Cast-In-Place Concrete” for concrete materials, admixtures, bonding materials, and other materials as required.

E. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

F. Expansion Joint Materials: Comply with requirements of Section 079200 - “Joint Sealants” for preformed and pourable expansion joint fillers and sealers.

G. Curing and Sealing Compound: Conform to TT-C-800, with 30% solids content minimum.

2.2 CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of Section 033000 “Cast-In-Place Concrete”, for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super-plasticizer), air-entraining admixture and water to produce the following properties:

1. Sidewalks and any entry pads, and mechanical equipment pads subject only to pedestrian traffic, unless indicated otherwise on the Drawings:

a. Compressive Strength: 3,000 psi, minimum at 28 days (minimum 550 psi flexural strength at 28 days).
b. Max Slump: Slip formed-2", Non Slip-4"
c. Air Content: 4% to 6%.
d. Thickness: 4", unless indicated otherwise.
e. Subgrade: 4" modified roadbed compacted to 98% Standard Proctor

2. Paving and pads subject to vehicular traffic, curb and gutters, valley gutters, dumpster pads, and where indicated (if any), unless indicated otherwise on the Drawings:

a. Compressive Strength: 4,000 psi, minimum at 28 days (minimum 550 psi flexural strength at 28 days).
b. Max Slump: Slip formed-2", Non Slip-4"
c. Air Content: 4% to 6%; and as required by referenced standards.
d. Thickness: 7" at typical vehicular pavement, unless greater thickness is indicated on the Drawings.
e. Subgrade: Unless otherwise indicated on the Drawings or required to match existing base material, provide 8" of GDOT graded aggregate base compacted to 98% Standard Proctor

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Proof-roll or verify by other acceptable method, the prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

C. Subgrade shall be approved by Contractor's Project Geotechnical Engineer and Architect's representative, and test reports shall be issued and received - before paving is begun.

3.2 FORM CONSTRUCTION:

A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances - ALSO REQUIRED FOR COMPLETED CONCRETE WORK:

1. Top of forms not more than 1/8" in 10'.
2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.3 REINFORCEMENT:

A. Locate, place and support reinforcement as specified in Section 033000 "Cast-In-Place Concrete", unless otherwise indicated. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.

3.4 CONCRETE PLACEMENT:

A. Comply with requirements of Section 033000 “Cast-In-Place Concrete”, for mixing and placing concrete, and as herein specified.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase, if required, to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

1. Concrete sidewalks shall slope as indicated, including in part, away from buildings and in the direction of existing or newly indicated drainage.

C. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with core to prevent dislocation of reinforcing, dowels, and joint devices.

1. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

3.5 JOINTS:

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints:

1. Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows below.
2. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
3. Sidewalks shall be scored in “squares” or at 5’-0” intervals, unless otherwise indicated or directed.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

D. Expansion Joints:

1. Provide expansion joints with premolded joint filler at locations abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
2. Extend joint fillers full-width and depth of joint.
3. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
4. Expansion joints for sidewalks shall be placed at 30-foot maximum intervals and along all intersections with other walks, steps, curbs, or other vertical surfaces.

E. Fillers and Sealants: Comply with the requirements of Section 079200 - “Joint Sealants”, for preparation of joints, materials, installation and performance.

3.6 CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Using hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10’ straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs and formed joints with an edging tool, and round to 1/4” radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Light and smooth broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation as required to provide a fine line texture acceptable to Architect.
2. MATCH ADJACENT FINISHED / EXISTING SIMILAR CONCRETE FINISHED APPEARANCE.

E. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

F. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

1. Provide rubbed finish for exposed edges of concrete work, and apply light and smooth broom finish.

3.7 CURING:

A. Protect and cure finished concrete paving, complying with applicable requirements of Section 033000 “Cast-In-Place Concrete”. Use curing and sealing compound or approved moist-curing methods.

B. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

3.8 REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy resign grout.

C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

SECTION 321613

CURBS AND GUTTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this section.

B. Related work specified elsewhere includes:

.. Section 31 2000 - “Earth Moving”
.. Section 32 1313 - “Concrete Paving”
.. Section 03 3000 - “Cast-In-Place Concrete”
.. Section 07 9200 - “Joint Sealants”

1.2 DESCRIPTION OF WORK

A. Work described in this section includes the construction of new concrete curbs and gutters, and/or straight curbs where indicated, and patching between any existing paving and new curb and gutters, sidewalks, etc., to match existing pavement.

B. Refer to Drawings and Owner’s Report of Geotechnical Exploration, for additional information and base requirements.

C. Refer to Section 31 2000 - “Earth Moving” for subgrade requirements below and beyond curbs and gutters.

D. Refer to Section 32 1313 - “Concrete Paving”, for valley gutters, turn-outs, and paving.

1.3 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of ready-mix concrete, reinforcing steel, curing material, joint fillers, and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the “GDOT Standard Specifications Construction of Transportation Systems”, latest edition.

C. Testing: All laboratory and field testing as required to ensure compliance with these specifications shall be performed by a qualified independent testing laboratory. Refer to Section 01 0150 - “Special Conditions”, for additional information.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concrete shall be Class “A”, Type 4 (4,000 psi), in accordance with the “GDOT Standard Specifications Construction of Transportation Systems”, latest edition. A modified mix shall be used if optional machine laid curb and gutter is constructed.

B. Reinforcing steel, where called for on the drawings, shall meet the requirements of “GDOT Standard Specifications Construction of Transportation Systems”, latest edition, “Steel Reinforcement”.

C. Curing material shall be either burlap cloth, waterproof paper, polyethylene sheeting, or impervious membrane.

D. Joint filler and sealer for expansion and construction joints shall meet the appropriate requirements of Section 07 9200 - “Joint Sealants” herein.

E. Asphalt for repairs shall comply with referenced GDOT Specifications, and city requirements, and shall match existing pavement at location(s) requiring patching.

PART 3 – EXECUTION

3.1 CURBS AND GUTTERS

A. Comply with requirements of Section 32 1313 - “Concrete Paving,” Section 03 3000 - “Cast-In-place Concrete,” and the following:

1. Construction requirements, including foundation, forms, sections, joints, placing and finishing concrete, curing and protection, and backfilling shall be as specified in “GDOT Standard Specifications Construction of Transportation Systems”, latest edition. Curbs and gutters shall match the profile of existing adjoining curb and gutter, if any, and otherwise as detailed.

2. Curb and gutter shall be constructed in sections having a maximum length of 10-feet. Transverse expansion joints with filler and joint sealer shall be installed at all curb returns and in curb and gutter at intervals not exceeding 40-feet. Similar joints shall be installed behind the curb where sidewalks adjoin the curb and gutter, and at all fixed objects which adjoin or extend through the curb and gutter.

3. Care shall be exercised that “tilt-out” curb and gutter is installed where pavement slopes away from the curb, and that 10-foot long transition sections are used where required to transition between “standard” and “tilt-out” curb and gutter.

3.2 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14-days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

1. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

SECTION 321723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work described in this section includes marking of graphic symbols, lane separations, parking stripes, and lettering on concrete and asphalt pavements, if any, at locations indicated and as shown on the Drawings.

B. Related work specified elsewhere includes:

.. Section 32 1216 - “Asphalt Paving”
.. Section 32 1313 - “Concrete Paving”

1.2 QUALITY CONTROL

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of materials, certifying that these products comply with specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be Georgia Department of Transportation (GDOT), “Standard Specifications Construction of Transportation Systems”, latest edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint for pavement marking shall be, traffic marking paint complying with Section 652, 653 and 654 of the GDOT specifications, and as follows:

1. Class 1, Type A, Thermoplastic (reflective) in public Rights-of-Way and on all traffic markings.

2. Class 1, Type B (non-reflective) within property lines of this project’s site, 2 coats.

3. Comply with requirements of Drawings and locality where project is located, if more stringent than above.

PART 3 - EXECUTION

3.1 PAVEMENT MARKING:

A. Each individual painted parking stripe shall be 4-inches wide and shall be laid out as indicated on the drawings. Construction requirements shall conform to the applicable parts of (GDOT), “Standard Specifications Construction of Transportation Systems”, for Class 1, Type as specified, traffic stripe.

1. Color shall be white for asphalt, yellow for concrete pavement, and international blue for striping and graphics for parking spaces for the disabled and handicapped.

2. Use same materials and construction methods for any arrows and symbols indicated on paved areas.

3. Mark paving at each accessible parking space with acceptable international graphics symbol, unless otherwise indicated, approximately 4' x 4' in size. Locate centered in space width and approximately 2'-0" from end of space where vehicle enters.

END OF SECTION

SECTION 331000

WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 31 2000 - “Earth Moving”
2. Division 22 – “Plumbing”

1.2 SUMMARY:

A. This Section includes water service piping system, meter, vaults, valves, and appurtenances from the existing on-site utility source of potable water to a point 5 feet outside the building, and as indicated on the Drawings, and in this Section of the Project Manual.

B. Note that the Contractor shall furnish and install connection, water meter, etc., acceptable to the utility company and call on the utility company to approve the meter and inspect the installation prior to covering.

C. All fees and charges for water service, meters, taps, permits, impact fees, etc., if any, shall be paid by the Contractor from their contract amount.

D. The extent of water service piping system, fire hydrants, etc., is indicated on the Drawings, in this Section, other referenced Sections of the Project Manual, and as otherwise required by authorities having jurisdiction.

1. All water pipe which run under roads, streets, driveways, and other vehicular paving shall be sleeved in AWWA C151 ductile iron sleeves.

E. Utility Compliance: Comply with Gwinnett County Water Authority regulations and standards pertaining to sanitary sewerage systems.

1. Where conflicts or discrepancies occur with the plans or these specifications, Gwinnett County Authority regulations and standards shall govern.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections

1. Product data for water service piping and fire protection pipe and specialties.
2. Shop drawings for vaults, junction boxes, valve boxes, manholes, meters, backflow preventers, and other similar water service equipment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS - GENERAL:

A. General: Pipe, valves, fittings and installation in R.O.W. and on site shall comply with requirements of this Section, other referenced Sections of the Project Manual, the Drawings, and the Gwinnett County Water Authority.

1. Pipe, fittings, hydrants and valves shall be as specified herein, subject to acceptance by the Gwinnett County Water Authority, unless other specific materials acceptable to the Gwinnett County Water Authority are indicated on the Drawings.

2. PVC piping and fittings smaller than 4" shall be C900 PVC, Class 200 plastic pipe, Schedule 40, or Type K Copper; and pipe 4" and larger, below paving and fire lines shall be ductile iron, of type(s) acceptable to the Gwinnett County Water Authority, unless other specific materials acceptable to the Gwinnett County Water Authority are indicated on the Drawings.

3. PVC water piping and fittings 4" and larger shall be C900, Class 250 plastic pipe of type acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.

4. Ductile iron pipe for fire lines, pipe below paving and where indicated shall meet ANSI A21.51, Grade 60-42-10, and special thickness pressure class 50, (For 6" Pipe this is the same 0.25" wall thickness as Class 350) ductile iron, of type(s) acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.

5. Note that all water pipe which run under roads, streets, driveways, and other vehicular paving shall be either ductile iron or shall be sleeved in ductile iron sleeves.

6.

7. Copper pipe where indicated, provide Soft Copper Tube, ASTM B 88-62, Type K hard drawn, water tube, annealed temper.
    a. Copper, Solder-Joint Fittings: AWWA C800-6 and 66. Corp stops shall be ¾" Ford F-1000 CC x COMP or equal, curb stops shall be ¾" Ford B-41-233W COMP x FIP or equal, and service saddles shall be dresser style 194 or equal. Furnish only wrought-copper fittings if indicated.

B. PVC Plastic, Schedule 40/80 PVC with pressure-rated fittings: Conform to ASTM D 1785 standard specifications for PVC plastic pipe.

C. PVC Plastic, Water Pipe: AWWA C900, Class 200. Include elastomeric seal according to ASTM F477.

1. Ductile Iron Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type, and specifically designed for joining PVC pipe; Include elastomeric seals according to ASTM F 477 or as otherwise required for joining plastic pipe specified

2. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended in writing by piping system manufacturer, unless otherwise indicated.

D. Where copper pipe is indicated, provide Soft Copper Tube, ASTM B 88, Type K, 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.

E. Ductile-Iron, Push-on-Joint Pipe: AWWA C151 and ANSI C150, C151, A21.50, and A21.15 respectively, Class 350 as approved by the Gwinnett County Water Authority, tar coated outside, with cement lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.

1. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111 (ANSI 21.11) and according to ASTM D-3139.

2. Joining Materials: AWWA C111 rubber gaskets and lubricant according to ASTM F477 requirements.

F. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

1. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

2. Joining Materials: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.

G. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

H. Pipe Sleeves: Provide pipe sleeves at least one size larger than water service piping required below existing concrete and paving, and as follows.

1. Below Concrete, Entry Pads, and Paving Subject to Only Pedestrian Traffic, and for Future Irrigation: Schedule 40/80 PVC.

2. Below Concrete, Equipment Pads, Dumpster Pads, Valley Gutters, Curbs and Gutters, Paving Subject to Vehicular Traffic, and Where Indicated: Ductile Iron, as specified above herein this Section.

I. Identification for Underground Plastic Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allen Systems, Inc.; Reef Industries, Inc.
b. Brady (W.H.) Co.; Signmark Div.
c. Calpico, Inc.
d. Carlton Industries, Inc.
e. EMED Co., Inc.
f. Seton Name Plate Co.

2. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in blue letters “CAUTION - WATER LINE BURIED BELOW.”

K. Domestic Water Meter – Provide in accordance with Gwinnett County Water Authority specifications.

1. Meter box and cover shall be traffic-bearing in all paved areas.

L. Tapping Sleeve and Valve:

1. Tapping sleeves and valves shall be Mueller, mechanical joint, 250 psi or equal.
2. Tapping sleeves shall have 24”x24”x8” concrete pad in undisturbed soil with solid blocking to support tapping valves.

M. Valves:

1. Unless otherwise specified, all gate valves up to 12” shall be resilient seat, and all gate valves larger than 12” shall be butterfly type. All valves larger than 12” shall receive approval from the County before installation.
2. Acceptable manufacturers of gate valves are American-Darling, Dresser M&H, or equal.

N. Valve Accessories:

1. All buried valves shall be furnished with cast iron, screw type; extendable valve boxes marked “WATER”. Acceptable manufacturers are Mueller, M&H Valve, or equal.
2. Valve boxes shall be mounted plumb in an 18” round concrete valve pad and centered over the operating nut.
3. One concrete valve marker shall be furnished and set at each line valve. The marker shall be made of 3,000 psi concrete with four #4 reinforcing bars. The size shall be four feet long by 4” on each side.

O. Hydrants

1. Fire Hydrants shall meet AWWA C-502-80 as well as the local authorities having jurisdiction.
2. Hydrants shall be manufactured by Mueller or an approved equal.
3. Hydrants shall be equipped with tamper proof caps that will work with County operating wrenches to prevent unauthorized use of water.
4. Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for at least 10 years from the date of manufacture.

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Comply with requirements of Division 22, the International Plumbing Code, Drawings, the Gwinnett County Water Authority and requirements of other authorities having jurisdiction.

B. Comply with requirements of the State Health Department, the local Health Department, and authorities having jurisdiction.

3.2 DEPTH OF COVER:

A. Provide minimum cover of 36-inches for all water bearing piping.

3.3 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.4 CLEANING:

A. Clean and disinfect water distribution piping as follows, or as required by utility company, Code, and authorities having jurisdiction:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.

2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:

a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.

b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.

c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.

d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

B. Prepare reports for all purging and disinfecting activities and submit for review and along with each set of “Record Documents”.

END OF SECTION

SECTION 33 3000

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

1. Section 31 2000 - “Earth Moving”
2. Section 03 3100 - “Concrete”
3. Division 22 - “Plumbing”

1.2 SUMMARY:

A. This Section includes sanitary sewerage system piping and appurtenances from a point 5 feet outside the building to the point of disposal.

B. The extent of sanitary sewerage system is indicated on the Drawings, in this Section 33 3000, and as otherwise required by authorities having jurisdiction.

C. All fees and charges for sanitary sewerage service, taps, connections, permits, impact fees, etc., shall be paid by the Contractor from their contract amount.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for drainage piping and specialties.
2. Shop drawings for precast concrete sanitary manholes, including frames and covers
   a. Shop drawings for cast-in-place concrete or field-erected masonry sanitary manholes, if any, including frames and covers
2. Test Reports.

1.4 QUALITY ASSURANCE:

A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.

B. Utility Compliance: Comply with Gwinnett County Sewer Authority regulations and standards pertaining to sanitary sewerage systems.

1. Where conflicts or discrepancies occur with the plans or these specifications, the Gwinnett County Sewer Authority regulations and standards shall govern.

C. Health Department Compliance: Comply with the State Department of Health Code or the local Health Department code, regulations and standards, whichever is more stringent.

D. Comply with requirements of authorities having jurisdiction, when more stringent than specified or otherwise indicated.

1.5 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research public utility records consult with Gwinnett County Sewer Authority Department and verify existing utility locations. Verify that sanitary sewerage system piping may be installed in compliance with original design and referenced standards.

1.6 SEQUENCING AND SCHEDULING:

A. Coordinate any connection to public sewer with Gwinnett County Sewer Authority.

B. Coordinate with interior building sanitary drainage piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cleanouts:

a. Ancon, Inc.
b. Josam Co.
c. Smith (Jay R.) Mfg. Co.
d. Wade Div.; Tyler Pipe.
e. Zurn Industries, Inc.; Hydromechanics Div.

2. Underground Warning Tapes:

a. Allen Systems, Inc.; Reef Industries, Inc.
b. Brady (W.H.) Co.; Signmark Div.
c. Calpico, Inc.
d. Carlton Industries, Inc.
e. EMED Co., Inc.
f. Seton Name Plate Co.

2.2 PIPE AND FITTINGS:

A. Ductile-Iron, Gravity Sewer Pipe and Fittings:

1. Pipe: Ductile iron pipe meeting AWWA C-150, C-151 and ANSI A21-50 and A 21.15 for coated outside and cement lined inside. Cement lining according to AWWA C104, Class 350.
2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
3. Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets: AWWA C111, rubber.

B. Pipe 8-inches and smaller, unless indicated otherwise:
   1. PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 26, for solvent cement or elastomeric gasket joints.
   2. Solvent Cement: ASTM D 2564, for pipe 4-inches and smaller.
   3. Gaskets: ASTM F 477, elastomeric seal, for pipe larger than 4-inches.

C. Couplings: Rubber or elastomeric sleeve and stainless-steel band assembly fabricated to match outside diameters of pipes to be joined.
   1. Sleeves: ASTM C 425, rubber for vitrified clay pipe; ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe; and ASTM F 477, elastomeric seal for plastic pipe. Sleeves for dissimilar or other pipe materials shall be compatible with pipe materials being joined.
   2. Bands: Stainless steel, one at each pipe insert.

D. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

E. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.

2.3 MANHOLES (if any):

A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints. All manhole covers shall be round.

   1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section and having a separate base slab or base section with integral floor.

   2. Riser Sections: 4-inch minimum thickness; 48-inch diameter, and lengths to provide depth indicated.

   3. Top Section: Concentric cone type, unless flat-slab-top type is indicated suitable for mounting cast from manhole frames and covers. Top of cone to match grade rings.

   4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.

   5. Gaskets: ASTM C 443, rubber.

   6. Steps: Cast into base, riser, and top sections sidewall at 12-to 16-inch equally spaced intervals.

   7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

   8. Channel and Bench: Concrete 8” wide.

B. Cast-in-Place Manholes (if any): Reinforced concrete of dimensions and with appurtenances indicated. All manhole covers shall be round.

1. Bottom, Walls, and Top: Reinforced concrete.
2. Channel and Bench: Concrete.
3. Steps: Cast into sidewall at 12- to 16-inch intervals.

C. Concrete: Portland cement mix, 4000 psi at 28 days

1. Cement: ASTM C 150, Type II with C3A content of 6.5% or less.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.
5. Refer to Section 033000 – “Cast-In-Place Concrete” for additional information and requirements.

D. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
3. Refer to Section 033000 – “Cast-In-Place Concrete” for additional information and requirements.

E. Steps: Same as for precast concrete manholes.

2.4 MANHOLE STEPS:

1. General: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.

1. Material: Ductile iron or cast aluminum.

2.5 CLEANOUTS:

A. General: Provide Mission adjustable repair coupling (or approved equal) with stainless steel bends and stainless-steel shear ring and a Zurn #ZN1400HD-3, Smith 4220 (or approved equal) cover set flush in a minimum 14” square concrete slab.

2.6 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid green in color with continuously printed caption in black letters “CAUTION - SEWER LINE BURIED BELOW.”

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill according to provisions in Section 31 2000 – Earth Moving.

C. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS:

A. Refer to Paragraph 2.2 above.

3.3 INSTALLATION, GENERAL:

A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.

B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use fittings for changes in direction. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at minimum slope of 1 percent, except where indicated otherwise.

F. Extend sanitary sewerage system piping to connect to building sanitary drains, of sizes and in locations indicated.

G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed, by tunneling, jacking, or a combination of both.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION:

A. Join and install PVC pipe as indicated in Part 2 above, and the following:
   1. Solvent cement joint pipe and fittings, joining with solvent cement in accordance with ASTM D 2855 and ASTM F 402.
   2. Pipe and gasketed fittings, joining with elastomeric seals in accordance with ASTM D 3212, and for truss pipe ASTM D 2680, Appendix XI.
   3. Installation in accordance with ASTM D 2321.

B. Join and install ductile iron pipe as indicated in Part 2 above.

3.5 CLEANOUTS:

A. Install cleanouts and extension from sewer pipe to cleanout at grade as indicated. Set cleanout lid in concrete block 14 by 14 by 12 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.6 TAP CONNECTIONS:

A. Make connections to existing piping and underground structures so that finished work will conform as nearly as practicable to the requirements specified for new work.

B. When tapping into existing man holes, use flexible rubber boot in accordance with Gwinnett County Sewer Authority requirements.

C. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap, with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

D. Make branch connections from side into existing 4- to 21-inch piping by removing section of existing pipe and installing wye fitting, into existing piping. Encase entire wye with not less than 6 inches of 3000-psi 28-day compressive-strength concrete.

1. Provide concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.

3.7 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.8 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

2. In large, accessible piping, brushes and brooms may be used for cleaning.

2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.

3. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

3. Make inspections after pipe between manholes and manhole locations has been installed and approximately 2 feet of backfill is in place, and again at completion of project.

2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects correct such defects, and reinspect.

END OF SECTION

SECTION 33 4000

STORMWATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related work specified elsewhere includes:

.. Section 31 2000 - “Earth Moving”
.. Section 03 3000 - “Cast-in-Place Concrete”

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes the construction of new storm drainage pipe and structures as shown on the Drawings

1.3 QUALITY CONTROL:

A. Certifications: The Contractor shall submit to the Architect copies of certificates from suppliers of pipe, gaskets, reinforcing steel, cast iron downspout boots, cast iron frames, covers and grates, pre-cast structures, ready-mix concrete and other manufactured items, certifying that these products comply with the specifications and standards listed hereinafter.

B. Standard Specifications: Unless otherwise noted, all specifications referred to shall be the Georgia Department of Transportation (GDOT) “Standard Specifications Construction of Transportation Systems”, Latest Edition.

C. Testing: All laboratory and field testing as required to ensure compliance with these specifications will be performed by an independent testing laboratory.

D. Comply with requirements of the International Plumbing Code, the American Concrete Pipe Association, and authorities having jurisdiction, when more stringent than specified or otherwise indicated

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Where indicated, pipe smaller than 12-inches in diameter shall be Schedule 80 PVC, Contech A2000 PVC (or approved equal), or ADS N-12 HP HDPE (or approved equal), or as indicated on the drawings.

1. Where indicated on the Drawings for “french drain”, “perforated underdrain”, foundation drain, planting or other areas, pipe shall be equivalent to ADS N-12 (perforated) corrugated HDPE pipe with smooth interior or perforated Contech A2000 PVC, complete with filter fabric “sock” and all required or necessary

system accessories, fittings, and components, specified in in GDOT Standard Specifications Section 845.2.01, unless otherwise indicated on the Drawings.

B. Pipe larger than 12-inches (or equivalent area in arch pipe) shall be one of the following unless specifically shown otherwise as specified in the GDOT Standard Specifications and as indicated on the Drawings:

1. Class 3 minimum reinforced concrete pipe (RCP) with rubber o-ring type gaskets.
2. Aluminized Type 2 “Ultra-flo” corrugated metal pipe (or approved equal)16 gauge or thicker with hugger type bands and flat band style gaskets installed according to the manufacturer’s specifications.

C. Concrete and reinforcing steel for headwalls, inlets, manholes, and other storm drainage structures shall comply with GDOT Standard Specifications. Concrete shall have a compressive strength of 4000 PSI.

D. Masonry materials and precast concrete units shall conform to (GDOT) “Standard Specifications Construction of Transportation Systems”, Latest Edition

E. Castings for frames, covers and grates in drainage structures shall comply with (GDOT) “Standard Specifications Construction of Transportation Systems”, Latest Edition.

1. All manhole covers shall be round.

F. Identification for Underground Plastic Pipe:

1. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid yellow in color with continuously printed caption in black letters “CAUTION – STORM SEWER LINE BURIED BELOW.”

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allen Systems, Inc.; Reef Industries, Inc.
b. Brady (W.H.) Co.; Signmark Div.
c. Calpico, Inc.
d. Carlton Industries, Inc.
e. EMED Co., Inc.
f. Seton Name Plate Co.

PART 3 - EXECUTION

3.1 STORM DRAIN PIPE:

A. Construction requirements, including excavation of trench, placing pipe, and backfilling around pipe shall conform to the applicable portions of (GDOT) “Standard Specifications Construction of Transportation Systems”, Latest Edition

B. Bedding for storm pipe shall be as detailed in the construction plans and as per the pipe manufacturer’s requirements, Type 3 or better installation. Open graded stone, such as #57 stone, is not allowed as backfill.

C. Compaction requirements for backfill shall be the same as specified for type of surface constructed over the trench, paved or planted areas as described in Section 31 2000 - “Earth Moving.”

D. Properly coordinate with elevations of grades, footings, other below grade work, and etc.

3.2 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.3 STRUCTURES:

A. Inlets, manholes, cleanouts and other storm drainage structures shall be installed or constructed in accordance with applicable portions of the following sections of the (GDOT) “Standard Specifications Construction of Transportation Systems”, Latest Edition:

END OF SECTION