

A NEW FIRE STATION ONE
located at
3170 Highway 77
for the
City of Southside, Alabama

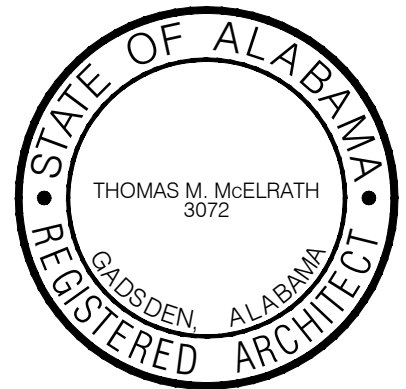
Dana Snyder
Mayor

Prepared By:

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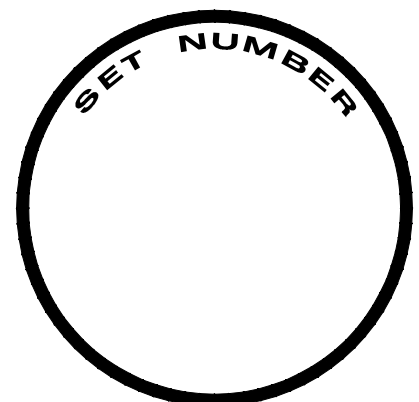
Architect's Project No. 2021-01
Date: November 15, 2021

PROJECT MANUAL



THOMAS M. McELRATH, ARCHITECT
ARCHITECTURE and SPACE PLANNING

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for
A NEW FIRE STATION ONE
located at
3170 Highway 77
for the
City of Southside, Alabama

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ADVERTISEMENT FOR BIDS

City of Southside, Alabama

2255 Highway 77

Southside, Alabama 35907

Separate sealed BIDS for the construction of A New 10,682 s.f. Fire Station and related Site Development work will be received by the City Clerk, City of Southside, Alabama in the Council Meeting Room of Southside City Hall, 2255 Highway 77 until 2:00 p.m., (Daylight Savings Time) August 25th, 2022, and then at said location, publicly opened and read aloud. Bid Documents are open to the public for inspection at Southside City Hall, 2255 Highway 77, Southside, Alabama, Alabama, AGC/ISQFT Plan Room; McGraw Hill Construction; and Construct Connect. Electronic copies of Bid Documents may be obtained from the Architect through email request only. No printed hard copies of Bid Documents will be issued. Requests for Bid Documents should be submitted to tom@tmm-architect.com. In order to submit a bid, all General Contractor bidders must use the procedures above to procure Bid Documents and having done so, will be placed on the Architect's Official Bidders List. Bids received from bidders who obtained Bid Documents through any other method and are not on the Architect's Official Bid List will be rejected. Thomas M. McElrath, Architect, makes no guarantee of bid documents obtained by Contractors and Vendors from sources other than the issued documents provided by the Architect. Contractors and Vendors who base their pricing from bid documents obtained otherwise, either in part or whole, do so at their own risk.

RD Instruction 1942-A
(Guide 19) (Attachment 1) (Page 2)

This project is financed by the USDA and as such, all USDA forms and AIA forms included in Part 1 of the Project Manual must be utilized and completed as required. Bids must be submitted on the Bid Form included in the Project Manual or copies thereof. The bidder must comply with all requirements of the public works bid law Section 39-2-1 et seq. and applicable provisions of Section 34-8-1, et .seq., Code of Alabama 1975. A current license number must be included on the bid submission envelope. Bid submissions that do not show the G.C. License number on the outside of the sealed bid will not be opened.

The successful bidder will provide proof of enrollment in the Federal E-Verify Program and in compliance with the Beason-Hammon Act (Act 2011-535).

CITY of SOUTHSIDE, ALABAMA

2255 Highway 77,

Southside Alabama 35907

THOMAS M. McELRATH, ARCHITECT

717 Merit Springs Road,

Gadsden, AL 35901



AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:

(Name, location, and detailed description)

A New Fire Station No. 1

THE OWNER:

(Name, legal status, address, and other information)

City of Southside, AL Inc.

2255 Highway 77

Southside, AL 35907

THE ARCHITECT:

(Name, legal status, address, and other information)

Thomas M. McElrath, Architect

717 Merit Springs Road

Gadsden, AL 35901

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document

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ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

Electronic copies of Bid Documents may be obtained from the Architect through email request only. The same process is applicable to sub-contractors and vendors. No printed hard copies of bid documents will be issued. Requests for Bid Documents should be submitted to tom@tmm-architect.com. No deposit is required.

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

All Bidding RFI's shall be submitted to the Architect by email. No verbal RFI's will be accepted or responded to.

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

Addenda will be issued by email to all Plan Holders of Record.

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter “No Change” or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder’s refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent’s authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

The bidder shall file with his bid either a cashier's check drawn on an Alabama bank, payable to the City of Southside, Alabama, or a bid bond executed by a surety company duly authorized and qualified to make such bonds in Alabama, in an amount equal to five percent (5%) of the total bid.

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning Sixty (60) days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

Sealed proposals will be received by the City Clerk, City of Southside, Alabama, at the City Hall, 2255 Highway 77, Council Meeting Room, Southside, Alabama 35907.

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

If the Bidder can show reasonable and satisfactory evidence of a clerical or mathematical mistake in their bid, the Owner, will refund the bid security.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 Drawings

Number

Pages 1-2

Title

Schedule of Drawings

Date

.6 Specifications

Section

All Sections

Title

Index to Specifications

Date

Pages

.7 Addenda:

Number

Date

Pages

.8 Other Exhibits:

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

☐

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

☐

The Sustainability Plan:

Title

Date

Pages



Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
RD 1942-A Guide 27	Attachment 4		

- .9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Project Manual (All documents listed in the Index to Project Manual)
Drawings (All drawings listed in the Schedule of Drawings in the Project Manual)

ATTACHMENT TO AIA DOCUMENT A701-2018, *Instructions to Bidders*

The provisions of this Attachment shall delete, modify and supplement the provisions contained in the "*Instructions to Bidders*", AIA Document A701-2018 Edition. The provisions contained in this Attachment will supersede any conflicting provisions of the AIA Document. The term "Agency", as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 2, BIDDER'S REPRESENTATIONS

2.1 Add the following subparagraph to paragraph 2.1:

2.1.7 This Bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid, with any other Bidder or with any competitor.

ARTICLE 4, BIDDING PROCEDURES

4.1.1 Add the following sentence to subparagraph 4.1.1:

Only one copy of the Bid is to be submitted.

4.2.1 Delete subparagraph 4.2.1 and substitute the following:

4.2.1 Each Bid must be accompanied by a Bid Bond payable to the Owner for five percent of the total amount of the Bid.

4.3 Add the following subparagraphs to paragraph 4.3:

4.3.6 All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project, shall apply to the Contract throughout.

4.3.7 The Bidder agrees to abide by the requirements of Executive Order 11246, specifically including the provisions of the Equal Opportunity Clause and the Standard Federal Equal Employment Construction Contract Specifications set forth in the Supplementary Conditions.

4.3.8 The Bidder agrees to abide by the requirements of section 319 of Public Law 101-121, which pertains to lobbying activities and applies to recipients of contracts or subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. Each Bid shall be accompanied by a completed lobbying certification form identical to that included in the Bidding Documents.

4.3.9 The Bidder agrees to abide by the requirements under 7 C.F.R. part 180, which pertains to the debarment or suspension of a person from participating in a Federal program or activity. Each Bid exceeding \$25,000 shall be accompanied by a relevant completed certification form identical to that included in the Bidding Documents.

4.4.3 Delete subparagraph 4.4.3 and substitute the following subparagraphs 4.4.3 and .1:

4.4.3 No Bidder may withdraw, modify or cancel a Bid within 60 calendar days after the actual date of the opening thereof. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended, by mutual agreement between the Owner and the Bidder, and the concurrence of the Agency.

4.4.3.1 In the event the lowest responsive bidder requests to withdraw its bid after a bid opening due to an unintentional error in its contents, the Owner may waive informalities, accept the request, and keep the bid security provided by the Bidder.

ARTICLE 5, CONSIDERATION OF BIDS

5.3.2 Delete subparagraph 5.3.2 and substitute the following:

5.3.2 The Owner shall have the right to accept Alternates in the sequence or combinations listed and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

ARTICLE 7, PERFORMANCE BOND AND PAYMENT BOND

7.1.1 Replace this subparagraph with the following:

Prior to execution of the Contract, the Bidder shall furnish Bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder. Both Bonds shall be separately written, each in the amount of the Contract Sum with Power of Attorney attached naming "The United States of America, acting through the United States Department of Agriculture, Rural Development as co-obligee. The cost shall be included in the Bid.

7.1.3 Delete subparagraph 7.1.3 and substitute the following:

7.1.3 Surety companies executing Bonds must hold a certificate of authority as a acceptable surety on Federal Bonds as listed in Treasury Circular 570, as amended, and be authorized to transact business in the State where the Project is located.

7.2.1 Delete subparagraph 7.2.1 and substitute the following:

7.2.1 The Bidder to whom the Contract is awarded will be required to execute the Agreement and obtain Performance and Payment Bonds, if required, within ten (10) calendar days from the date when the Notice of Award is delivered to the Bidder. The Notice shall be accompanied by the necessary Agreement and Bond forms.

7.2.2 Delete subparagraph 7.2.2 and substitute the following:

7.2.2 The Bonds shall be written on forms identical to those included in the Bidding Documents.

SPECIAL INSTRUCTIONS TO BIDDERS:

1.00 The following are Special Instructions to Bidders and supplement the AIA 701-2018 Instructions to Bidders and RD 1942-A, Guide 27, Attachment 2 Instructions to Bidders.

1.01 General Contractors are encouraged to utilize as many sub-contractors and purchase as many materials from within Etowah County as possible.

1.02 EXAMINATION OF BID DOCUMENTS & THE SITE OF THE WORK: A Mandatory Attendance Pre-Bid Conference will be conducted at Southside City Hall located at 2255 Highway 77, Southside, Alabama 35907 at 10:00 a.m. The date for this Pre-Bid Conference will be issued by Addendum. All General Contractors expecting to submit a bid shall have a knowledgeable representative at this meeting. Attendance is mandatory.

1.03 PREPARATION & DELIVERY OF BIDS: The Contractor's Base Bid and all Alternate Bids (if any) submitted on the Proposal Form SHALL NOT INCLUDE the costs of all required taxes including sales and use taxes. This is a tax-exempt project.

A. Per the Alabama Department of Revenue (ADOR), Act 2013-205, the project will be bid EXCLUDING TAXES. Both tax exempt entity and contractor shall apply for certificates of exemption. ADOR shall issue certificates of exemption from sales and use tax for each tax-exempt project. Certificates shall only be issued to contractors licensed by the State Licensing Board for General Contractors or any subcontractor working under the same contract. Items eligible for exemption are building materials, construction materials and supplies and other tangibles that become part of the structure. ADOR will handle the administration of the certificates and the accounting of exempt purchases.

1.04 CONSIDERATION OF BIDS: The successful bidder shall furnish to the Architect a written LIST OF SUB-CONTRACTORS within 24 hours of the date and closing time set for the receipt of bids

BID

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as _____*. To the _____ (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of _____ in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to its own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within Five-hundred forty (540) consecutive calendar days thereafter. BIDDER further agrees to pay as liquidated damages, the sum of \$ 575.00 for each consecutive calendar day thereafter as provided in Section 15 of the General Conditions.

RD Instruction 1942-A
(Guide 19 - Attachment 3) (Page 2)

BIDDER acknowledges receipt of the following ADDENDUM:

* Insert "a corporation", "a partnership", or "an individual" as applicable.

BIDDER agrees to perform all the work described in the CONTRACT
DOCUMENTS for the following unit prices or lump sum:

BID SCHEDULE

NOTE: See RD 1942-A, Guide 27, Attachment 2, A701-2018, Inst. to Bidders for
procedures regarding the Owner's Tax Exempt Status. .

NO.	ITEM	UNIT	UNIT PRICE	AMOUNT	TOTAL PRICE
-----	------	------	------------	--------	-------------

NO.	ITEM	UNIT	UNIT PRICE	AMOUNT	TOTAL PRICE
-----	------	------	------------	--------	-------------

TOTAL OF BID \$ _____
LUMP SUM PRICE (if applicable) \$ _____

Respectfully submitted:

Signature

Address

Title

Date

License number (if applicable)

SEAL - (if BID is by a corporation)

ACCOUNTING OF SALES TAX
Attachment to ABC Form C-3
Proposal Form

To: _____ Date: _____
(Awarding Authority)

NAME OF PROJECT _____

SALES TAX ACCOUNTING

Pursuant to Act 2013-205, Section 1(g) the Contractor accounts for the sales tax NOT included in the bid proposal form as follows:

	<u>ESTIMATED SALES TAX AMOUNT</u>
BASE BID:	\$ _____
Alternate No. 1 (.....) (Insert key word for Alternate)	(add)(deduct) \$ _____
Alternate No. 2 (.....)	(add)(deduct) \$ _____
Alternate No. 3 (.....)	(add)(deduct) \$ _____
Alternate No. 4 (.....)	(add)(deduct) \$ _____
Alternate No. 5 (.....)	(add)(deduct) \$ _____
Alternate No. 6 (.....)	(add)(deduct) \$ _____

Failure to provide an accounting of sales tax shall render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.

Legal Name of Bidder _____

Mailing Address _____

*** By (Legal Signature)** _____

*** Name (type or print)** _____

(Seal)

*** Title** _____

Telephone Number _____

(Guide 19 - Attachment 4)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

_____ as Principal, and
_____ as Surety, are hereby
held and firmly bound unto _____ as OWNER in the
penal sum of

_____ for the
payment of which, well and truly to be made, we hereby jointly and
severally bind ourselves, successors and assigns.

Signed, this _____ day of _____,
19_____. The Condition of the above obligation is such that
whereas the Principal has submitted to

_____ a certain BID, attached
hereto and hereby made a part hereof to enter into a contract in
writing, for the

NOW, THEREFORE,

- (a) If said BID shall be rejected, or
- (b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attachment hereto (Properly completed in accordance with said BID) and shall furnish a BOND for faithful performance of said contract, and for the payment of all persons performing labor furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

(1-15-79) SPECIAL PN

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____(L.S.)
Principal

Surety

By: _____

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

oOo

EQUAL OPPORTUNITY AGREEMENT

This agreement, dated _____ between _____

(herein called "Recipient" whether one or more) and United States Department of Agriculture (USDA), pursuant to the rules and regulations of the Secretary of Labor (herein called the 'Secretary') issued under the authority of Executive Order 11246 as amended, witnesseth:

In consideration of financial assistance (whether by a loan, grant, loan guaranty, or other form of financial assistance) made or to be made by the USDA to Recipient, Recipient hereby agrees, if the cash cost of construction work performed by Recipient or a construction contract financed with such financial assistance exceeds \$10,000 - 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.

1. To incorporate or cause to be incorporated into any contract for construction work, or modification thereof, subject to the relevant rules, regulations, and orders of the Secretary or of any prior authority that remain in effect, which is paid for in whole or in part with the aid of such financial assistance, the following "Equal Opportunity Clause":

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

- (a) 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 apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the USDA setting forth the provisions of this nondiscrimination clause.
- (b) 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 for employment without regard to race, color, religion, sex or national origin.
- (c) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the USDA, advising the said labor union or workers' representative of the contractor's commitments under this agreement and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (d) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of all rules, regulations and relevant orders of the Secretary of Labor.
- (e) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, rules, regulations, and orders, or pursuant thereto, and will permit access to his books, records, and accounts by the USDA Civil Rights Office, and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (f) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by Law.
- (g) The contractor will include the provisions of paragraph 1 and paragraph (a) through (g) in every subcontract or purchase order, unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 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 USDA may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the USDA, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collections is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

- 2. To be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the organization so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.
- 3. To notify all prospective contractors to file the required 'Compliance Statement', Form RD 400-6, with their bids.
- 4. Form AD-425, Instructions to Contractors, will accompany the notice of award of the contract. Bid conditions for all nonexempt federal and federally assisted construction contracts require inclusion of the appropriate "Hometown" or "Imposed" plan affirmative action and equal employment opportunity requirements. All bidders must comply with the bid conditions contained in the invitation to be considered responsible bidders and hence eligible for the award.
- 5. To assist and cooperate actively with USDA and the Secretary in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and rules, regulations, and relevant orders of the Secretary, that will furnish USDA and the Secretary such information such as , but not limited to, Form AD-560, Certification of Nonsegregated Facilities, to submit the Monthly Employment Utilization Report, Form CC-257, as they may require for the supervision of such compliance, and that it will otherwise assist USDA in the discharge of USDA's primary responsibility for securing compliance.
- 6. To refrain from entering into any contract or contract modification subject to such Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and Federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by USDA or the Secretary of Labor pursuant to Part II, Subpart D, of the Executive Order.
- 7. That if the recipient fails or refuses to comply with these undertakings, the USDA may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the organization under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such organization; and refer the case to the Department of Justice for appropriate legal proceedings.

Signed by the Recipient on the date first written above.

<div>_____</div> <div>Recipient</div>	<div>_____</div> <div>Recipient</div>
<div>(CORPORATE SEAL)</div>	<div>_____</div> <div>Name of Corporate Recipient</div>
<div>Attest:</div> <div>_____</div> <div>Secretary</div>	<div>By _____</div> <div>President</div>

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I ☐ have ☐ have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I ☐ have, ☐ have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.
☐ If the proposed contract is for \$50,000 or more: or ☐ if the proposed nonconstruction contract is for \$50,000 or more and I have 50 or more employees, I also represent that:
3. I ☐ have, ☐ have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, 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, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I 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; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB Control Number for this information collection is 0575-0018. Public reporting for this collection of information is estimated to be approximately 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. All responses to this collection of information are voluntary. However, in order to obtain or retain a benefit, the information in this form is required 7 CFR 1901-E. Rural Development has no plans to publish information collected under the provisions of this program. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Rural Development Innovation Center, Regulations Management Division at ICRMTRequests@usda.gov.

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

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

Date _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, 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 or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

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 or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of 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.

(name)

(date)

(title)

oOo

RD Instruction 1942-A
(Guide 19 - Attachment 7)

NOTICE OF AWARD

TO: _____

PROJECT Description: _____

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, 19____, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 19____.

Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged
by _____
this the _____ day of _____, 19____.
By _____
Title _____



AIA® Document A101® – 2017

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

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

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

City of Southside, AL Incorporated
2255 Highway 77
Southside, Alabama 35907

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

TBD
TBD
TBD

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

A New Fire Station No. 1
3170 Highway 77, Southside, Alabama

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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

Thomas M. McElrath, Architect
717 Merit Springs Road
Gadsden, AL 35901

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

☐

The date of this Agreement.

☐

A date set forth in a notice to proceed issued by the Owner.

☐

Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

☐

Not later than
the date of commencement of the Work.

() calendar days from

☐

By the following date:

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

Portion of Work

Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be

(\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

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

Item

Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item

Price

Conditions for Acceptance

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

Item

Price

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

Item

Units and Limitations

Price per Unit (\$0.00)

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

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

Init.

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

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

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

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

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

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

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

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

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

(Insert any other conditions for release of retainage upon Substantial Completion.)

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

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

§ 5.2 Final Payment

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

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

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

§ 5.3 Interest

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

(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

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

(Check the appropriate box.)

- ☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- ☐ Litigation in a court of competent jurisdiction
- ☐ Other *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

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

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner’s representative:

(Name, address, email address, and other information)

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

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

§ 8.5 Insurance and Bonds

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

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

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date
--------	-------	------

.6 Specifications

Section	Title	Date	Pages
---------	-------	------	-------

.7 Addenda, if any:

Number	Date	Pages
--------	------	-------

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

.8 Other Exhibits:

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

☐

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

☐

The Sustainability Plan:

Title	Date	Pages
-------	------	-------

☐

Supplementary and other Conditions of the Contract:

Document

Title

Date

Pages

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

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

OWNER (Signature)

CONTRACTOR (Signature)

(Printed name and title)

(Printed name and title)

Init.

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AIA Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the _____ day of _____ in the _____ year

(In words, indicate day, month and year.)

for the following **PROJECT:**

(Name and location or address)

A New Fire Station No. 1
3170 Highway 77, Southside, Alabama

THE OWNER:

(Name, legal status and address)

City of Southside, AL Incorporated
2255 Highway 77
Southside, Alabama 35907

THE CONTRACTOR:

(Name, legal status and address)

TBD
TBD
TBD

TABLE OF ARTICLES

- A.1 GENERAL
- A.2 OWNER'S INSURANCE
- A.3 CONTRACTOR'S INSURANCE AND BONDS
- A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201®–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

This document has important legal consequences.

Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201–2017 contains additional insurance provisions.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 **Causes of Loss.** The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

Cause of Loss

Sub-Limit

§ A.2.3.1.2 **Specific Required Coverages.** The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage

Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 **Deductibles and Self-Insured Retentions.** If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 **Occupancy or Use Prior to Substantial Completion.** The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The

Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, “all-risks” property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

☐

§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner’s property, or the inability to conduct normal operations due to a covered cause of loss.

☐

§ A.2.4.2 Ordinance or Law Insurance, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

☐

§ A.2.4.3 Expediting Cost Insurance, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

☐

§ A.2.4.4 Extra Expense Insurance, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

☐

§ A.2.4.5 Civil Authority Insurance, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

☐

§ A.2.4.6 Ingress/Egress Insurance, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

☐

§ A.2.4.7 Soft Costs Insurance, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

☐

§ A.2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

☐

§ A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage

Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than (\$) each occurrence, (\$) general aggregate, and (\$) aggregate for products-completed operations hazard, providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than (\$) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than (\$) each accident, (\$) each employee, and (\$) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than (\$) per claim and (\$) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

☐

§ A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible,

and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

- ☐
- § A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for Work within fifty (50) feet of railroad property.
- ☐
- § A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.
- ☐
- § A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an “all-risks” completed value form.**
- ☐
- § A.3.3.2.5 Property insurance on an “all-risks” completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.**
- ☐
- § A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum (\$0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:



Init.

ATTACHMENT TO AIA DOCUMENT A101-2017, *Standard Form of Agreement
Between Owner and Contractor*

The provisions of this Attachment shall delete, modify and supplement the provisions contained in the "*Standard Form of Agreement Between Owner and Contractor*," AIA Document A101-2017 Edition. The provisions contained in this attachment shall supersede any conflicting provisions of the AIA Document.

ARTICLE 3, DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

Delete paragraph 3.1 and substitute the following:

3.1 The date of commencement shall be contained in the Notice to Proceed.

Replace paragraph 3.3.3 with the following:

If the work is not substantially complete on or before this date, or within this period of time, or extension thereof granted by the Owner, damage will be sustained by the Owner and that it is and will be impracticable and extremely difficult to fix the actual damage which the Owner will sustain in the event of and by reason of such delays. The Contractor shall pay to the Owner liquidated damages in the sum of \$ _____ for each calendar day of delay. Any sums that may be due the Owner as liquidated damages may be deducted from any monies due or to become due the Contractor under the Contract or may be collected from the Contractor's surety.

ARTICLE 5, PAYMENTS

Insert "ten" and "10" in the appropriate spaces in subparagraph 5.1.3.

Delete the following from clause 5.1.6.2:

(or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing)

Insert the following sentences in subparagraph 5.1.7.1:

The amount retained shall be 10% of the value of Work until 50% of the Work has been completed or a withholding of equal or greater value, such as, 5% for the full duration of the project. If 10% is held, at 50% completion, further partial payments shall be made in full to the Contractor and no additional amounts may be retained unless the Architect certifies that the Work is not proceeding satisfactorily, but amounts previously retained shall not be paid to the Contractor. At 50% completion or any time thereafter when the progress of the Work is not satisfactory, additional amounts may be retained, but in no event shall the total retainage be more than 10% of the value of Work completed.

ARTICLE 8, MISCELLANEOUS PROVISIONS

Add the following subparagraph to paragraph 8.7:

8.7.1 This Agreement shall not become effective until concurred in writing by the Agency. Such concurrence shall be evidenced by the signature of a duly authorized representative of the Agency in the space provided at the end of this Attachment to the Agreement. The concurrence so evidenced by the Agency shall in no way commit the Agency to render financial assistance to the Owner and is without liability to the Agency for any payment thereunder, but in the event such assistance is provided, the concurrence shall signify the provisions of this Agreement are consistent with Agency requirements.

ARTICLE 9, ENUMERATION OF CONTRACT DOCUMENTS

The following Documents should be referenced, if applicable:

Subparagraph 9.1.3:

Attachment to the *Standard Form of Agreement Between Owner and Contractor* (this Attachment)
General Conditions of the Contract for Construction, AIA A201-2017
Attachment to the *General Conditions of the Contract for Construction* (RD Instruction 1942-A, Guide 27, Attachment 4)
Special Conditions

Subparagraph 9.1.7:

Invitation for Bids (Form RD 1924-5)
Instructions to Bidders, AIA A701-1997
Attachment to the *Instructions to Bidders* (RD Instruction
1924-A, Guide 27, Attachment 2)
Bid Form
Bid Bond
Compliance Statement (Form RD 400-6)
Payment Bond
Performance Bond
Certification Regarding Debarment, Suspension,
Ineligibility and Voluntary Exclusion - Lower Tier
Covered Transactions (Form AD 1048)
Disclosure of Lobbying Activities (SF-LLL)
Certification for Contracts, Grants and Loans (RD
Instruction 1940-Q, Exhibit A-1)

Delete the signature block on page 7 of this Agreement, and substitute
the block on the following page:

RD Instruction 1942-A
Guide 27
Attachment 3
Page 4

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in duplicate on the respective dates indicated below:

OWNER:

ATTEST: _____
Type Name _____
Title _____
Date _____

By _____
Type Name _____
Title _____
Date _____

CONTRACTOR:

ATTEST: _____
Type Name _____
Title _____
Date _____

By _____
Type Name _____
Title _____
Date _____

AGENCY CONCURRENCE:

By _____
Type Name _____
Title _____
Date _____

The concurrence so evidenced by the Agency shall in no way commit the Agency to render financial assistance to the Owner and is without liability to the Agency for any payment hereunder, but in the event such assistance is provided, the concurrence shall signify the provisions of this Agreement are consistent with Agency requirements.

o0o

14. Certificate of Owner's Attorney.

I, the undersigned, _____, the duly authorized
and acting legal representative of _____
_____, do hereby certify as follows

I have examined the attached contract(s) and performance and
payment bond(s) and the manner of execution thereof, and I am of the
opinion that each of the aforesaid agreements are adequate and have has
been duly executed by the proper parties thereto acting through their
duly authorized representatives; that said representatives have full
power and authority to execute said agreements on behalf of the
respective parties named thereon; and that the foregoing agreements
constitute valid and legally binding obligations upon the parties
executing the same in accordance with terms, conditions, and provisions
thereof.

Date: _____

NOTE: Delete phrase "performance and payment bonds" when not
applicable.

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount: \$

Description:

(Name and location)

"DRAFT"

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and

Title:

Signature: _____

Name and

Title:

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

Init.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 16 Definitions

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

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

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

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

Init.

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

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

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

§ 18 Modifications to this bond are as follows:

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

CONTRACTOR AS PRINCIPAL

Company: _____ *(Corporate Seal)*

Signature: _____

Name and Title: _____

Address: _____

SURETY

Company: _____ *(Corporate Seal)*

Signature: _____

Name and Title: _____

Address: _____

(Guide 19 - Attachment 6)

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

(Name of Contractor)_____
(Address of Contractor)a _____ hereinafter called PRINCIPAL and
(Corporation, Partnership or Individual)_____
(Name of Surety)

hereinafter called SURETY, are held and firmly bound unto _____

(Name of Owner)_____
(Address of Owner)

hereinafter called OWNER and the United States of America acting through Rural Development hereinafter referred to as GOVERNMENT, and unto all persons, firms, and corporations who or which may furnish labor, or who furnish materials to perform as described under the contract and to their successors and assigns in the total aggregate 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, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the PRINCIPAL entered into a certain contract with the OWNER, dated the _____ day of _____ 19____, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the PRINCIPAL shall promptly make payment to all persons, firms, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extensions or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and for all labor cost incurred in such WORK including that by a SUBCONTRACTOR, and to any mechanic or materialman lienholder whether it acquires its lien by operation of State or Federal law; then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, that beneficiaries or claimants hereunder shall be limited to the SUBCONTRACTORS, and persons, firms, and corporations having a direct contract with the PRINCIPAL or its SUBCONTRACTORS.

PROVIDED, FURTHER, that the said SURETY for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the WORK or to the SPECIFICATIONS.

PROVIDE, FURTHER, that no suit or action shall be commenced hereunder by any claimant: (a) Unless claimant, other than one having a direct contract with the PRINCIPAL (or with the GOVERNMENT in the event the GOVERNMENT is performing the obligations of the OWNER), shall have given written notice to any two of the following: The PRINCIPAL, the OWNER, or the SURETY above named within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the PRINCIPAL, OWNER, or SURETY, 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. (b) After the expiration of one (1) year following the date of which PRINCIPAL ceased work on said CONTRACT, is being understood, however, that if any limitation embodied in the BOND is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

PROVIDED, FURTHER, that it is expressly agreed that this BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 20 percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the Contract as so amended. The term "Amendment", wherever used in this BOND and whether referring to this BOND, the contract or the loan Documents shall include any alteration, addition, extension or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER or GOVERNMENT and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

(Guide 19 - Attachment 6) (Page 3)

WITNESS WHEREOF, this instrument is executed in ____ counterparts, each of
Number
which shall be deemed an original, this the ____ day of _____.

ATTEST:

_____ (Principal) Secretary	_____ Principal
(SEAL)	By _____(s)
	_____ (Address)
_____ Witness as to Principal	_____ _____ Surety
_____ (Address)	
ATTEST:	
_____ Witness as to Surety	By _____ Attorney-in-Fact
_____ (Address)	_____ (Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR Is partnership, all partners should execute BOND.
IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the Project is located.

oOo



AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount: \$

Description:

(Name and location)

"DRAFT"

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and

Title:

Signature: _____

Name and

Title:

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

Init.

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

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

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

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

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

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

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

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

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

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

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

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

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

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

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

CONTRACTOR AS PRINCIPAL

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

Init.

(Guide 19 - Attachment 5)

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

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

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto _____

(Name of Owner)

(Address of Owner)

hereinafter called OWNER, and the United States of America acting through
Rural Development hereinafter referred to as the Government in the total
aggregate 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,
successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered
into a certain contract with the OWNER, dated the _____ day of _____
19____, a copy of which is hereto attached and made a part hereof for the
construction of:

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, or GOVERNMENT, with or without notice to the SURETY and during the one year guaranty period and if the PRINCIPAL shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER and GOVERNMENT from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER and GOVERNMENT all outlay and expense which the OWNER and GOVERNMENT may incur in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the liability of the PRINCIPAL AND SURETY hereunder to the GOVERNMENT shall be subject to the same limitations and defenses as may be available to them against a claim hereunder by the OWNER, provided, however, that the GOVERNMENT may, at its option, perform any obligations of the OWNER required by the contract.

PROVIDED, FURTHER, that the said SURETY, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that it is expressly agreed that the BOND shall be deemed amended automatically and immediately, without formal and separate amendments hereto, upon amendment to the Contract not increasing the contract price more than 20 percent, so as to bind the PRINCIPAL and the SURETY to the full and faithful performance of the CONTRACT as so amended. The term "Amendment", wherever used in this BOND, and whether referring to this BOND, the Contract or the Loan Documents shall include any alteration, addition, extension, or modification of any character whatsoever.

PROVIDED, FURTHER, that no final settlement between the OWNER or GOVERNMENT and the PRINCIPAL shall abridge the right of the other beneficiary hereunder, whose claim may be unsatisfied. The OWNER and GOVERNMENT are the only beneficiaries hereunder.

(Guide 19 Attachment 5) (Page 3)

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each
Number
one of which shall be deemed an original, this the _____ day of _____
_____ .

ATTEST:

Principal

(Principal) Secretary

(SEAL)

By _____ (s)

(Witness as to Principal) (Address)

(Address)

Surety

ATTEST:

Witness to Surety BY _____

Attorney-in-Fact

(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract.

If CONTRACTOR is partnership, all partners should execute BOND.
IMPORTANT: Surety companies executing BONDS must appear on the Treasury
Department's most current list (Circular 570 as amended) and be authorized to
transact business in the state where the Project is located.

oOo

NOTICE TO PROCEED

TO: _____ DATE: _____

Project: _____

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 19__, on or before _____, 19__, and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 19__.

Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____

_____,
this the _____, 19__

By _____

Title _____

Employer Identification
Number _____

oOo



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

A New Fire Station No. 1
3170 Highway 77, Southside, AL

THE OWNER:

(Name, legal status and address)

City of Southside, AL Incorporated
2255 Highway 77
Southside, AL 35907

THE ARCHITECT:

(Name, legal status and address)

Thomas M. McElrath, Architect
717 Merit Springs Road
Gadsden, AL 35901

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This document has important legal consequences.

Consultation with an attorney is encouraged with respect to its completion or modification.

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk

and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in

such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or

equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of

other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner’s Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

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

(3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

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

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

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

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

§ 11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract

Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in

Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

ATTACHMENT TO AIA DOCUMENT A201-2017, *General Conditions of the Contract for Construction*

The provisions of this attachment shall delete, modify and supplement the provisions contained in the "*General Conditions of the Contract for Construction*," AIA Document A201-2017 Edition. The provisions contained in this attachment will supersede any conflicting provisions of the AIA Document. The term "Agency," as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 1, GENERAL PROVISIONS

Add the following subparagraph:

1.2.4 Concurrence of the Contract by the Agency is required before it is effective.

ARTICLE 2, OWNER

Delete subparagraph 2.3.6 and substitute the following:

2.3.6 The Contractor will be furnished, free of charge, _____ copies of the Drawings and Projects Manuals necessary for execution of the Work. Additional copies will be available from the Architect at the cost of reproduction and handling.

ARTICLE 4, ARCHITECT

Add the following to subparagraph 4.1.1:

The term "Architect" means the Architect, or the Engineer when the nature of the work is within the authority granted engineers by the State licensure law, or an authorized representative of the Architect or Engineer.

ARTICLE 5, SUBCONTRACTORS

Add the following to subparagraph 5.2.2:

The Contractor shall not contract with any party who is suspended or debarred by any Federal government agency from participating in Federally assisted construction projects.

ARTICLE 7, CHANGES IN THE WORK

Delete the words ", Construction Change Directive" from subparagraph 7.1.1.

Insert the words ", Agency " after the word "Owner," and delete the words "A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor" in subparagraph 7.1.2.

Delete the words "Construction Change Directive" from subparagraph 7.1.3.

Delete subparagraph 7.2.1 and substitute the following:

7.2.1 A Change Order is a written order to the Contractor utilizing Form RD 1924-7, "Contract Change Order," or AIA G-701 signed by the Owner, Architect, Contractor, and the Agency representative. It is issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. The Contractor's signing of a Change Order indicates complete agreement therein.

Add subparagraph 7.2.2:

7.2.2 Methods used in determining adjustments to the Contract Sum may include any of the following:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluating.
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon.

Add the following sentence to paragraph 7.3.1: "A Construction Change Directive may be used only for a change in response to an emergency as described in paragraph 10.4.

Delete subparagraph 7.3.2.

Add the following, where appropriate, to 7.3.3 through 7.3.10: "When the use of a Construction Change Directive is justified"

ARTICLE 8, TIME

Add the following subparagraphs:

8.2.4 The Notice to Proceed shall be issued within twenty (20) calendar days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement of the Owner and Contractor, with the concurrence of the Agency. If the Notice to Proceed has not been issued within the twenty (20) calendar day period or within the period mutually agreed, the Contractor may terminate the Agreement without further liability on the part of either party.

8.3.4 As outlined in Article 3 of the Agreement, the Contractor agrees to pay liquidated damages to the Owner for each calendar day the Contractor shall be in default.

ARTICLE 9, PAYMENTS AND COMPLETION

Delete clause 9.3.1.1 and substitute the following:

9.3.1.1 Work performed and materials supplied under a Change Order may be included for payment only after the Change Order has been approved by all appropriate parties, including the Agency.

Add the words ", using AIA Document 702, 'Application and Certificate for Payment' or Form RD 1924-18, 'Partial Payment Estimate'," after "Certificate for Payment" in subparagraph 9.4.1.

Add the following subparagraph:

9.6.9 No progress payments will be made that deplete the retainage, nor place in escrow any funds that are required for retainage, nor invest the retainage for the benefit of the Contractor. Retainage will not be adjusted until after construction is substantially complete.

Replace the word "seven" with the words "fifteen (15)" in the first sentence, second line of subparagraph 9.7.

Delete subparagraph 9.8.5, after the first sentence, and substitute the following:

9.8.5 When the Work has been substantially completed, except for Work which cannot be completed because of weather conditions, lack of materials or other reasons, which, in the judgment of the Owner, are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed. Provide a copy of the Certificate to the Agency.

Delete subparagraphs 9.9.1 and add the following:

9.9.1 The Contractor agrees to the use and occupancy of a portion or unit of the Project before formal acceptance by the Owner under the following conditions:

- .1 A "Certificate of Substantial Completion" shall be prepared and executed as provided in subparagraph 9.8.4, except that when, in the opinion of the Architect, the Contractor is chargeable with unwarranted delay in completing the Work or other Contract requirements, the signature of the Contractor will not be required. The Certificate of Substantial Completion shall be accompanied by a written endorsement of the Contractor's insurance carrier and surety permitting occupancy by the Owner during the remaining period of the Project Work. Occupancy and use by the Owner shall not commence until authorized by public authorities having jurisdiction over the Work.
- .2 Occupancy by the Owner shall not be construed by the Contractor as being an acceptance of that part of the Project to be occupied.
- .3 The Contractor shall not be held responsible for any damage to the occupied part of the Project resulting from the Owner's occupancy.
- .4 Occupancy by the Owner shall not be deemed to constitute a waiver of existing claims in behalf of the Owner or Contractor against each other.
- .5 If the Project consists of more than one building, and one of the buildings is to be

occupied, the Owner, prior to occupancy of that building, shall secure permanent property insurance on the building to be occupied and necessary permits which may be required for use and occupancy.

Add to subparagraph 9.9.3: Use and occupancy by the Owner prior to Project acceptance does not relieve the Contractor of responsibility to maintain all insurance and bonds required of the Contractor under the Contract Documents until the Project is completed and accepted by the Owner.

ARTICLE 11, INSURANCE AND BONDS

Replace the words "the Contract Documents" with the words "subparagraph 11.1.1" in the first sentence of subparagraph 11.1.2.

Add the following subparagraph:

11.1.1. Insurance shall be:

- .1 Written with a limit of liability of not less than \$500,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than \$500,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than \$200,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than \$200,000 aggregate for any such damage sustained by two or more persons in any one accident, or
- .2 Written with a combined bodily injury and damage liability of not less than \$700,000 per occurrence; and with an aggregate of not less than \$700,000 per occurrence.

Add the following sentence to the end of subparagraph 11.3.1:

The provisions of this subparagraph shall apply to the Contractor if the Contractor purchases and maintains said insurance coverage.

Delete subparagraph 11.1.2 and substitute the following:

11.1.2 The Contractor shall furnish the Owner bonds covering faithful performance of the Contract and payment of obligations arising thereunder within ten (10) calendar days after receipt of the Notice of Award. The surety company executing the bonds must hold a certificate of authority as an acceptable surety on Federal bonds as listed in Treasury Circular 570, and be authorized to transact business in the State where the Project is located. The bonds (using the forms included in the Bidding Documents) shall each be equal to the amount of the Contract Sum. The cost of these bonds shall be included in the Contract Sum

Add the following subparagraphs:

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

11.1.3.2 If at any time a surety on any such bond is declared bankrupt or loses its right to do business in the State in which the work is to be performed or is removed from the list of surety companies accepted on Federal Bonds, the Contractor shall within ten (10) calendar days after notice from the Owner to do so, substitute an acceptable bond in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums of such bond shall be paid by any Contractor. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Owner.

ARTICLE 13, MISCELLANEOUS PROVISIONS

Add the following paragraphs:

13.6 LANDS AND RIGHTS-OF WAY

13.6.1 Prior to the start of construction, the Owner shall obtain all lands and rights-of-way necessary for the execution and completion of work to be performed under this contract.

13.7 EQUAL OPPORTUNITY REQUIREMENTS

Non-discrimination in Employment by Federally Assisted Construction Contractors, by Executive Order 11246.

13.7.1 This section summarizes Executive Order 11246, which prohibits employment discrimination and requires employers holding non-exempt Federal contracts and subcontracts and federally-assisted construction contracts and subcontracts in excess of \$10,000 to take affirmative action to ensure equal employment opportunity without regard to race, color, religion, sex, or national origin. The Executive Order requires, as a condition for the approval of any federally assisted construction contract, that the applicant incorporate nondiscrimination and affirmative action clauses into its non-exempt federally assisted construction contracts.

13.7.2 Executive Order 11246, is administered and enforced by the Office of Federal Contract Compliance Programs (OFCCP), an agency in the U.S. Department of Labor's Employment Standards Administration. OFCCP has issued regulations at 41 CFR chapter 60 implementing the Executive Order. The regulations at 41 CFR part 60-4 establish the procedures which the Agency, as an administering agency, must follow when making grants, contracts, loans, insurance or guarantees involving federally assisted construction which is not exempt from the requirements of Executive Order 11246. The regulations which apply to Federal or federally assisted construction contractors also are published at 41 CFR part 60-4.

13.7.3 OFCCP has established numerical goals for minority and female utilization in construction work. The goals are expressed in percentage terms for the contractor's aggregate workforce in each trade. OFCCP has set goals for minority utilization based on the percentage of minorities in the civilian labor force in the relevant area. There is

a single nationwide goal of 6.9 percent for utilization of women. The goals apply to all construction work in the covered geographic area, whether or not it is federal, federally assisted or non-federal. A notice advises bidders of the applicable goals for the area where the project is to be located.

13.7.4 Application. This section applies to all of a construction contractor's or subcontractor's employees who are engaged in on-site construction including those construction employees who work on a non-Federal or non-Federally assisted construction site.

13.7.4.1 Agency officials will notify the appropriate Regional Director of OFCCP that an Agency financed construction contract has been awarded, and that the equal opportunity clauses are included in the contract documents.

13.7.4.2 The Regional Director, OFCCP-DOL, will enforce the non-discrimination requirements of Executive Order 11246.

13.7.5 The prospective contractor or subcontractor must comply with the Immigration Reform and Control Act of 1986, by completing and retaining Form I-9, "Employment Eligibility Verification," for employees hired. This form is available from the Immigration and Naturalization Service, and Department of Justice.

13.7.6 The prospective contractor or subcontractor must submit Form RD 400-6, "Compliance Statement," to the applicant and an Agency official as part of the bid package, prior to any contract bid negotiations and comply with the Executive Order 11246 as stated in the contract documents.

13.8 STATUTES

13.8.1 The Contractor and each Subcontractor shall comply with the following statutes (and with regulations issued pursuant thereto, which are incorporated herein by reference):

13.8.1.1 Copeland Anti-Kickback Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3). This Act provides that each Contractor shall be prohibited from inducing, by any means, any person in connection with construction to give up any part of the compensation to which the person is otherwise entitled.

13.8.1.2 Clean Air Act (42 U.S.C. 7414), section 114, and Water Pollution Control Act (33 U.S.C. 1813), section 308. Under Executive Order 11738 and Environmental Protection Agency (EPA) regulations 40 C.F.R. part 15, all Contracts in excess of \$100,000 are required to comply with these Acts. The Acts require the Contractor to:

- .1 Notify the Owner of the receipt of any communication from EPA indicating that a facility to be utilized in the performance of the Contract is under consideration to be listed on the EPA list of Violating Facilities.
- .2 Certify that any facility to be utilized in the performance of any nonexempt Contractor or Subcontractor is not listed on the EPA list of Violating Facilities as of the date of the Contract Award.
- .3 Include or cause to be included the above criteria and requirements of paragraphs .1 and .2 in every nonexempt subcontract, and that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

13.8.1.3 Restrictions on Lobbying (Public Law 101-121, section 319) as supplemented in Department of Agriculture regulations (7 CFR part 3018). This statute applies to the recipients of contracts or subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, the Contractor must complete a certification form on lobbying activities related to the specific Federal loan or grant that is a funding source for this contract. The certification and disclosure forms shall be provided by the Owner.

13.9 RECORDS

13.9.1 If the Contract is based on a negotiated Bid, the Owner, the Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor which are pertinent to a specific Federal loan program for the purpose of making audit, examination, excerpts, and transcriptions. The Contractor shall maintain records for at least three years after the Owner makes final payment and all other pending matters are closed.

13.10 ENVIRONMENTAL REQUIREMENTS

13.10.1 Mitigation Measures - The contractor shall comply with applicable mitigation measures established in the environmental assessment for the project. These may be obtained from the Agency representative.

13.10.2 The Contractor, when constructing a Project involving trenching, excavating, or other earth moving activity, shall comply with the following environmental constraints:

13.10.2.1 Endangered Species, Historic Preservation, Human Remains and Cultural Items, Hazardous Materials, and Paleontology - Any excavation or other earth moving activity by the Contractor that provides evidence of the presence of endangered or threatened species or their critical habitat, uncovers a historical or archaeological artifact, human remains or cultural items, hazardous materials, a fossil or other paleontological materials will require the Contractor to:

- .1 Temporarily stop work;
- .2 Provide immediate notice to the Architect and the Agency, and in the case of potentially hazardous materials, provide immediate notice to local first responders and take such measures as necessary to protect the public and workers;
- .3 Take reasonable measures as necessary to protect the discovered materials or protected resource;
- .4 Abide by such direction as provided by the Agency, or Agencies responsible for resource protection or hazardous materials management; and
- .5 Resume work only upon notice from the Architect and the Agency.

13.10.3 Lead-Based Paint - The Contractor and Owner shall comply with applicable Agency requirements of the Lead-Based Paint Poisoning Prevention Act, as amended (42 U.S.C. 4821), and the Residential Lead-Based Paint Hazard Reduction Act of 1992 (42 U.S.C. 4851) for rehabilitation work on residential property built prior to 1978.

13.11 DEBARMENT AND SUSPENSION

13.11.1 The Contractor shall comply with the requirements of 7 CFR part 3017, which pertains to the debarment or suspension of a person from participating in a Federal program or activity.

ARTICLE 15 CLAIMS AND DISPUTES

Add the words "may be" after "on the parties but" in the last sentence of subparagraph 15.2.5.

Replace the word "shall" with the word "may" in the first sentence, first occurrence of subparagraph 15.3.2

Add the subparagraph: 15.4.1.2 The arbitrators will select a hearing location as close to the Owner's locale as possible.

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Application and Certificate for Payment

TO OWNER: City of Southside, AL Inc. 2255 Highway 77 Southside, Alabama 35907 FROM CONTRACTOR: TBD TBD TBD	PROJECT: A New Fire Station One 3170 Highway 77, Southside, AL VIA ARCHITECT: Thomas M. McElrath, Architect 717 Merit Springs Road Gadsden, AL 35901	APPLICATION NO: XXX PERIOD TO: CONTRACT FOR: CONTRACT DATE: PROJECT NOS: / /	Distribution to: OWNER <input type="checkbox"/> ARCHITECT <input type="checkbox"/> CONTRACTOR <input type="checkbox"/> FIELD <input type="checkbox"/> OTHER <input type="checkbox"/>
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CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
 AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM	\$ _____
2. NET CHANGE BY CHANGE ORDERS	\$ _____
3. CONTRACT SUM TO DATE (Line 1 ± 2)	\$ _____
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	\$ _____
5. RETAINAGE:	
a. _____ % of Completed Work (Columns D + E on G703)	\$ _____
b. _____ % of Stored Material (Column F on G703)	\$ _____
Total Retainage (Lines 5a + 5b, or Total in Column I of G703)..... \$ _____	
6. TOTAL EARNED LESS RETAINAGE	\$ _____ (Line 4 minus Line 5 Total)
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	\$ _____ (Line 6 from prior Certificate)
8. CURRENT PAYMENT DUE	\$ _____
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 minus Line 6)	\$ _____

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$ _____	\$ _____
Total approved this month	\$ _____	\$ _____
TOTAL	\$ _____	\$ _____
NET CHANGES by Change Order	\$ _____	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

County of: _____

Subscribed and sworn to before
 me this _____ day of _____

Notary Public:

My commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$ _____

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.



Document G703® – 1992

Continuation Sheet

AIA Document G702®, Application and Certification for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: XXX

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED <i>(Not in D or E)</i>	TOTAL COMPLETED AND STORED TO DATE <i>(D + E + F)</i>	% <i>(G ÷ C)</i>	BALANCE TO FINISH <i>(C – G)</i>	RETAINAGE <i>(If variable rate)</i>
			FROM PREVIOUS APPLICATION <i>(D + E)</i>	THIS PERIOD					
	GRAND TOTAL								

Form RD 1924-18
(Rev. 6-97)UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT
FARM SERVICE AGENCY**PARTIAL PAYMENT ESTIMATE**

CONTRACT NO. _____

PARTIAL PAYMENT ESTIMATE NO. _____

PAGE _____

OWNER: _____

CONTRACTOR: _____

PERIOD OF ESTIMATE

FROM _____ TO _____

CONTRACT CHANGE ORDER SUMMARY

ESTIMATE

No.	Agency Approval Date	Amount		
		Additions	Deductions	
				1. Original Contract
				2. Change Orders
				3. Revised Contract (1 + 2)
				4. Work Completed*
				5. Stored Materials*
				6. Subtotal (4 + 5)
				7. Retainage*
				8. Previous Payments
				9. Amount Due (6-7-8)
				* Detailed breakdown attached
TOTALS				
NET CHANGE				

CONTRACT TIME

Original (days) _____
Revised _____
Remaining _____

On Schedule

☐ Yes☐ No

Starting Date _____

Projected Completion _____

CONTRACTOR'S CERTIFICATION:

The undersigned Contractor certifies that to the best of their knowledge, information and belief the work covered by this payment estimate has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous payment estimates was issued and payments received from the owner, and that current payment shown herein is now due.

Contractor _____

By _____

Date _____

APPROVED BY OWNER:

Owner _____

By _____

Date _____

ARCHITECT OR ENGINEER'S CERTIFICATION:

The undersigned certifies that the work has been carefully inspected and to the best of their knowledge and belief, the quantities shown in this estimate are correct and the work has been performed in accordance with the contract documents.

Architect or Engineer _____

By _____

Date _____

ACCEPTED BY AGENCY:

The review and acceptance of this estimate does not attest to the correctness of the quantities shown or that the work has been performed in accordance with the contract documents.

By _____

Title _____

Date _____

[illegible]

* As a minimum, detailed breakdowns should contain this information.

Form RD 1924-7

(Rev. 2-97)

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT AND
FARM SERVICE AGENCY

CONTRACT CHANGE ORDER

ORDER NO. _____

DATE _____

STATE _____

COUNTY _____

CONTRACT FOR _____

OWNER _____

To _____

(Contractor)

You are hereby requested to comply with the following changes from the contract plans and specifications:

Description of Changes (Supplemental Plans and Specifications Attached)	DECREASE in Contract Price	INCREASE in Contract Price
	\$ _____	\$ _____
	_____	_____
	_____	_____
TOTALS	\$ _____	_____
NET CHANGE IN CONTRACT PRICE	\$ _____	_____

JUSTIFICATION:

The amount of the Contract will be (Decreased) (Increased) By The Sum Of: _____

Dollars (\$ _____).

The Contract Total Including this and previous Change Orders Will Be: _____

Dollars (\$ _____).

The Contract Period Provided for Completion Will Be (Increased) (Decreased) (Unchanged) : _____ Days.

This document will become a supplement to the contract and all provisions will apply hereto.

Requested _____
(Owner)

(Date)

Recommended _____
(Owner's Architect/Engineer)

(Date)

Accepted _____
(Contractor)

(Date)

Accepted by Agency _____
(Name and Title)

(Date)

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-01042. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

- ☐ ORIGINAL-BORROWER'S CASE FOLDER
☐ COPY-CONTRACTOR
☐ COPY-BORROWER



AIA® Document G704™ – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)*

A New Fire Station No. 1
3170 Highway 77, Southside, AL

OWNER: *(name and address)*

City of Southside, AL Inc.
2255 Highway 77
Southside, AL 35907

CONTRACT INFORMATION:

Contract For:
Date:

ARCHITECT: *(name and address)*

Thomas M. McElrath, Architect
717 Merit Springs Road
Gadsden, AL 35901

CERTIFICATE INFORMATION:

Certificate Number:
Date:

CONTRACTOR: *(name and address)*

TBD
TBD
TBD

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate. *(Identify the Work, or portion thereof, that is substantially complete.)*

ARCHITECT *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE OF SUBSTANTIAL COMPLETION

WARRANTIES

The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED

A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows: *(Identify the list of Work to be completed or corrected.)*

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within () days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: \$

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:

(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE

OWNER *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE



AIA® Document G707™ – 1994

Consent of Surety to Final Payment

PROJECT: *(Name and address)*

A New Fire Station No. 1

3170 Highway 77

Southside, AL 35907

TO OWNER: *(Name and address)*

City of Southside, AL Incorporated

2255 Highway 77

Southside, Alabama 35907

ARCHITECT'S PROJECT NUMBER:

OWNER ☐

CONTRACT FOR:

ARCHITECT ☐

CONTRACTOR ☐

CONTRACT DATED:

SURETY ☐

OTHER ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

on bond of
(Insert name and address of Contractor)

, SURETY,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve
the Surety of any of its obligations to
(Insert name and address of Owner)

, CONTRACTOR,

as set forth in said Surety's bond.

, OWNER,

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

(Surety)

(Signature of authorized representative)

Attest:
(Seal)

(Printed name and title)

Date _____

Dear Sir:

I hereby acknowledge the receipt of _____ dollars
(\$ _____) in full payment of my contract dated _____ for improvement work which I did for you and
which is described in my contract.

I certify that I have paid in full for all materials purchased and all labor employed in the performance of this contract, and that there
are no claims against me under this contract on account of injuries sustained by workers employed by me or by subcontractors
thereunder. I hereby release you from any claims arising by virtue of this contract.

I am attaching Form RD 1924-10, "Release by Claimants," signed by all persons from whom I have purchased materials and by all
subcontractors and all persons employed in connection with my contract with the above-named borrower.

WARNING

**The statements and representations made above are made in connection with construction financed in whole or
in part by the United States Department of Agriculture (USDA). The statements and representations will be
used to determine the release of USDA provided funds. The making of any false statement or misrepresentation
herein may be a crime punishable under Title 18 U.S.C. § 1001 which provides in part: "Whoever, in any matter
within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or
covers up by any trick, scheme, or device a material fact, or makes any false, fictitious or fraudulent statements or
representations, or makes or uses any false writing or statement or entry, shall be fined under [title 18 of the United
States code] or imprisoned not more than five years, or both.**

Sincerely,

Contractor

Position 6

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

RELEASE BY CLAIMANTS

The undersigned, having received payment in full for all labor, materials, supplies, or equipment supplied to _____, Contractor, or to any subcontractor, in the construction or repair of the improvements upon the property located at:

_____, and furnished in the execution and fulfillment of contract between said Contractor and _____ Owner, dated _____

_____, do (does) hereby release and waive any and all claims, liens, and lien rights, of any kind, nature, or description whatsoever, against said property and the Owner thereof, and against said Contractor.

<i>Lien or Claimant</i>	<i>Work or Materials</i>	<i>Amount</i>	<i>Date</i>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

BUILDER'S WARRANTY

Names and Address of Purchasers or Owners

Property

For good and valuable consideration, the undersigned Warrantor hereby warrants to the Purchasers or Owners identified above and to the successors or transferees, all of whom are hereinafter referred to as Owners that:

The building, including appurtenances located on the property identified above, is constructed or improved in substantial conformity with the drawings and specifications which have been accepted in writing by the respective USDA Agency. This warranty applies to all workmanship, materials, and the installation of equipment (including, but not limited to, the heating system, water heater, ranges and refrigerator).

The Owners shall give written notice to the Warrantor promptly after the discovery of any defective condition. Such written notice must be given to the Warrantor during the period of warranty. The period of warranty shall be (a) in the case of new construction or rehabilitation, one year from the date of initial occupancy of the completed or rehabilitated building, or (b) in the case of improvements made to an existing building owned by the Owners prior to the improvements being made, one year from the date of the completion of the work.

It is agreed and understood that this warranty shall apply only to those defective conditions of which the Warrantor has been given written notice during the period of warranty.

Warrantor further agrees that warrantor will take any necessary actions to correct such defective conditions within _____ days of receipt of written notice. If such action is not taken within _____ days, the Owners may, at their option, contract with another party for the correction of the defects. Warrantor agrees to pay any expenses incurred by the Owners to correct defects covered by this warranty.

This warranty shall be in addition to, and in no way reduce, all other rights and privileges which such Owners may have under any other law or instrument, and shall be binding on the Warrantor notwithstanding any provision to the contrary contained in the contract of purchase or any other instrument executed by the Owners.

This warranty is executed, in part, for the purpose of inducing the United States Department of Agriculture, (USDA) to make, insure, or guarantee a loan on the Property.

If this warranty is signed by anyone other than the Warrantor, the person signing for the Warrantor represents and certifies that the person is authorized to execute same by the Warrantor and by the person's signature the Warrantor is bound under the terms and conditions of this warranty

- NOTES: A. The warrantor must complete all three copies except dates, meet with owner to agree on notification period, sign and give to the Owner with the final request for payment.
Owner must meet with Warrantor to agree on warranty notification period and to date and sign the warranty, owner must retain original, and forward one copy to contractor, and one to the respective USDA Agency with the final request for payment.
- B. This warranty shall be required in all cases involving new construction or rehabilitation of buildings including those built under contract, those built for sale without the respective USDA Agency's required construction inspections and those under conditional commitment procedures.

WARNING

Section 1001 of Title 18, United States Code provides: "Whoever, in any matter within the jurisdiction of any department or agency of the United States knowingly and willfully . . . makes any false, fictitious or fraudulent statements or representation, or makes or uses any false writing or document knowing the same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than \$250,000 or imprisoned not more than five years, or both."

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

In addition to the preceding warranty, the following items are covered by a company warranty or guarantee as follows:

Item	Serial & Model No.	Name and Address of Company	No. Yrs. or Mos. of Warranty

NOTICE TO OWNERS: ANY NOTICE OF DEFECTIVE WORKMANSHIP, MATERIALS OR NONCONFORMITY MUST BE DELIVERED TO THE WARRANTOR NO LATER THAN

_____ .

(Warrantor shall insert date one (1) year from initial occupancy, date of conveyance of title or date of completion, whichever is applicable.) All plastic pipe used in this job will carry a 5-year warranty from the date shown by the Warrantor above.

We have furnished the above company warranties or guarantees to the Owners for their use. If this warranty covers a manufactured home, we certify that the manufactured home property substantially complies with the plans and specifications and the manufactured home sustained no hidden damage during transportation and, if manufactured in separate sections, that the sections were properly joined and sealed according to the manufacturer's specifications.

The Warrantor has signed this warranty this _____ day of _____ , _____ .

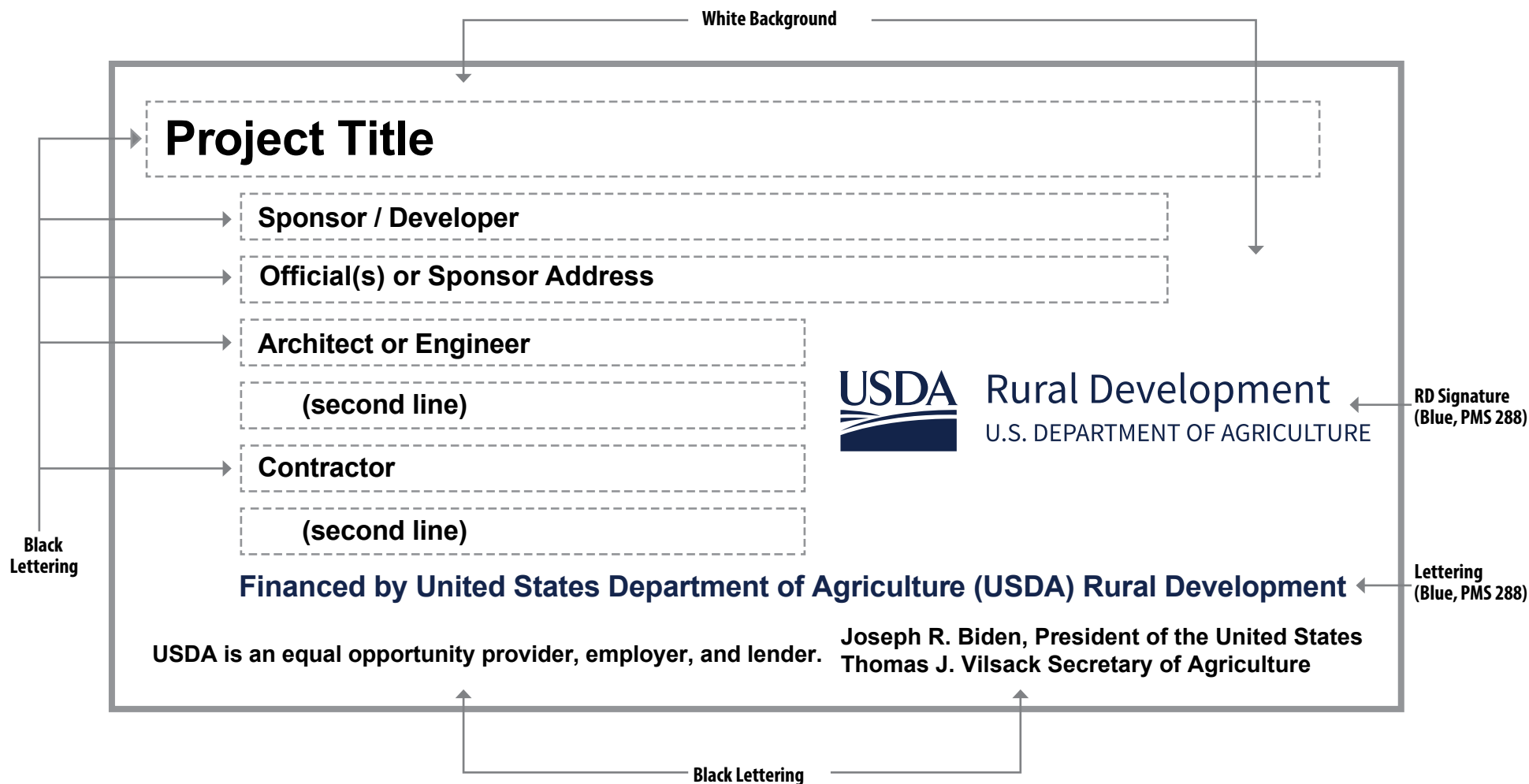
_____(Warrantor's Address) _____(SEAL)
Warrantor (Signature & Title)

Receipt of this warranty is acknowledged this _____ day of _____ , _____ .

Owner(s)

TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS

Recommended Fonts: Helvetica or Arial



SIGN DIMENSIONS : 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

REQUIRED BY THE STATE OF ALABAMA IMMIGRATION ACT
Act No. 2011-535

"Under penalty of perjury, I _____
PRINT NAME

the undersigned do hereby declare that I am a United States Citizen or that I am a lawfully
present alien of the United States of America.

DECLARANT'S SIGNATURE

DATE

Contractor:

Project No. _____

--	--	--	--	--	--

Page ____ of ____

PROGRESS SCHEDULE AND REPORT			CONTRACTOR:										DATE OF REPORT			
PROJECT			ARCHITECT:										PROCEED DATE			
													PROJECTED COMPLETION DATE			

WORK DIVISION	%	AMOUNT													
1. GENERAL REQUIREMENTS															
2. SITEWORK															
3. CONCRETE															
4. MASONRY															
5. METALS															
6. WOOD AND PLASTIC															100%
7. THERMAL AND MOISTURE PROTECTION															90%
8. DOORS AND WINDOWS															80%
9. FINISHES															70%
10. SPECIALTIES															60%
11. EQUIPMENT															50%
12. FURNISHINGS															40%
13. SPECIAL CONSTRUCTION															30%
14. CONVEYING SYSTEMS															20%
15. MECHANICAL															10%
16. ELECTRICAL															0%
TOTAL ORIG. CONTRACT	100%														
ANTICIPATED DRAW IN \$1,000															
ACTUAL DRAW IN \$1,000															

LEGEND:

ANTICIPATED ACTIVITY

ACTUAL ACTIVITY

ANTICIPATED CASH FLOW

ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS SCHEDULED MORE THAN 12 MONTHS

GENERAL CONTRACTOR'S ROOFING GUARANTEE

--

Project Name & Address	Project Owner(s) & Address

General Contractor's Name, Address, & Telephone Number	EFFECTIVE DATES OF GUARANTEE
	Date of Acceptance:
	Date of Expiration:

1. The General Contractor does hereby certify that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved roofing manufacturer's recommendations.
2. The General Contractor does hereby guarantee the roofing and associated work including but not limited to all flashing and counter flashing both composition and metal, roof decking and/or sheathing; all materials used as a roof substrate or insulation over which roof is applied; promenade decks or any other work on the surface of the roof; metal work; gravel stops and roof expansion joints to be absolutely watertight and free from all leaks, due to faulty or defective materials and workmanship for a period of five (5) years, starting on the date of substantial completion of the project. This guarantee does not include liability for damage to interior contents of building due to roof leaks, nor does it extend to any deficiency which was caused by the failure of work which the general contractor did not damage or did not accomplish or was not charged to accomplish.
3. Subject to the terms and conditions listed below, the General Contractor also guarantees that during the Guarantee Period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the roofing manufacturers standards as are necessary to correct faulty and defective work and/or materials which may develop in the work including, but not limited to: blisters, delamination, exposed felts, ridges, wrinkles, splits, warped insulation and/or loose flashings, etc. in a manner pursuant to the total anticipated life of the roofing system and the best standards applicable to the particular roof type in value and in accordance with construction documents as are necessary to maintain said work in satisfactory condition, and further, to respond on or within three (3) calendar days upon proper notification or leaks or defects by the Owner or Architect.

- A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: (1) lightning, windstorm, hailstorm and other unusual phenomena of the elements; and (2) fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the Owner or by the responsible party so designated.
- B. During the Guarantee Period, if the Owner allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the owner engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with the said work, shall have notified the Owner in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.
- C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.
- D. During the Guarantee period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
- E. The Owner shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, 20 _____.

General Contractor's Authorized Signature

Typed Name and Title

PRIOR APPROVAL

1. **SUBSTITUTIONS**: Prior approval shall be required for proposed substitutions for equals to items as specified in these Specifications. Bidders shall submit written requests at least ten (10) calendar days before the opening of bids for general contract. Requests received after this time shall not be considered. Request shall clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability. Base request shall also include a confirmation that product will be ready for delivery to job site in accordance with the need of general contractor or sub-contractors. If the substitution is acceptable, the Architect shall approve the product in an Addendum.
2. **SUBMISSION**: Following is a form to be used for submission of request to Architect for approval of substitutes and/or unspecified products. Submission shall be made on bidder's letterhead and submitted to Architect. Make separate submission for each substitute item.

REQUEST FOR PRIOR APPROVAL OF SUBSTITUTE

Project No. **2021-01**
Title: **A NEW FIRE STATION NO. 1
located at
3170 Highway 77
for the
City of Southside, Alabama**

Location: **Southside, Alabama**

Bidders License No. _____(If applicable)

Specifications or Drawings Reference: Section No. _____ Page No. _____

Paragraph _____ Drawing No. _____

Specified Item: _____

Submitted Item: _____

List of three installations:

1. _____

2. _____

3. _____

(Give Project Name and Location) _____

State differences between specified item and submitted item, if any:

Signed: _____ Date: _____

END

ASBESTOS-FREE CERTIFICATION

PROJECT

A NEW FIRE STATION NO. 1

located at

3170 Highway 77

for the

City of Southside, Alabama

Upon completion of this construction provide three (3) original copies of this form transmitting two (2) directly to the Owner by certified mail and one (1) to the Project Architect. This action shall be taken prior to request for final payment.

I, _____

hereby certify that the construction known as _____

does not contain friable or non-friable asbestos and that any removal and/or abatement conducted during this project was done so in accordance with all required ordinances, regulations and mandates as required by law.

Contractor _____

Principal Officer (signature) _____

Principal Officer (typed name and title) _____

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

_____ L.S.

My Commission expires _____

FORM OF ADVERTISEMENT OF COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, notice is hereby given that

(Contractor)

Contractor, has completed the Contract for Construction of

**A NEW FIRE STATION NO. 1
located at
3170 Highway 77
for the
City of Southside, Alabama**

at _____
(Insert location in County or City)

for the City of Southside, Alabama, 2255 Highway 77, Southside, Alabama, Owner, and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify:

Thomas M. McElrath, Architect, 717 Merit Springs Road, Gadsden, Alabama 35901
(Architect)

(Contractor)

(Business Address)

Note: This notice must be run once a week for four (4) successive weeks or, for projects of less than \$20,000.00, run one (1) time only. Proof of publication is required.

TITLE SHEET

CIVIL

C1.0	OF	07	EXISTING SITE SURVEY
C2.0	OF	07	SITE LAYOUT PLAN
C3.0	OF	07	SITE GRADING PLAN
C4.0	OF	07	STORMWATER HYDRAULICS & EROSION CONTROL PLAN
C5.0	OF	07	SITE UTILITY PLAN
C6.0	OF	07	MISC. DETAILS
C7.0	OF	07	MISC. UTILITY DETAILS

ARCHITECTURAL

A2.0	OF	17	LIFE SAFETY PLAN
A2.1	OF	17	FLOOR PLAN-ARCHITECTURAL NOTES
A2.2	OF	17	FLOOR PLAN-DIMENSIONS
A2.3	OF	17	REFLECTED CEILING PLAN
A3.0	OF	17	DOOR AND WINDOW ELEVATIONS AND SCHEDULES
A3.1	OF	17	DOOR AND WINDOW DETAILS-SHEET ONE
A3.2	OF	17	DOOR AND WINDOW DETAILS-SHEET TWO
A4.0	OF	17	ELEVATIONS
A5.0	OF	17	ROOF PLAN, SECTIONS & DETAILS
A5.1	OF	17	SECTIONS & DETAILS
A6.0	OF	17	CROSS SECTIONS – SHEET ONE
A6.1	OF	17	CROSS SECTIONS – SHEET TWO
A7.0	OF	17	WALL SECTIONS – SHEET ONE
A7.1	OF	17	WALL SECTIONS – SHEET TWO
A8.0	OF	17	LARGE SCALE PARTIAL PLANS, ELEVATIONS & SCHEDULES
A8.1	OF	17	INTERIOR ELEVATIONS
A8.2	OF	17	LARGE SCALE STAIR PLANS and SECTIONS

STRUCTURAL

S1.0	OF	07	GENERAL NOTES
S1.1	OF	07	GENERAL NOTES
S1.2	OF	07	TYPICAL DETAILS
S1.3	OF	07	TYPICAL DETAILS
S2.1	OF	07	FOUNDATION & FLOOR PLAN, MEZZANINE FRAMING PLAN
S2.2	OF	07	ROOF FRAMING PLAN
S7.0	OF	07	SECTIONS

PLUMBING

FP0.1	OF	06	FIRE PROTECTION SCHEDULE AND NOTES
FP.1	OF	06	FIRE PROTECTION FLOOR PLAN
P0.1	OF	06	PLUMBING SCHEDULES AND NOTES
P0.2	OF	06	PLUMBING RISERS
P1.0	OF	06	NON-PRESSURE PIPING FLOOR PLAN
P2.0	OF	06	PRESSURE PIPING FLOOR PLAN

MECHANICAL

M0.1	OF	10	MECHANICAL LEGEND AND SCHEDULES
M0.2	OF	10	MECHANICAL SCHEDULES AND CONTROLS
M0.3	OF	10	MECHANICAL DETAILS
M0.4	OF	10	MECHANICAL DETAILS
M0.5	OF	10	MECHANICAL DETAILS
M0.6	OF	10	MECHANICAL OSA CALCULATIONS
M0.7	OF	10	MECHANICAL OSA CALCULATIONS
M1.0	OF	10	MECHANICAL FLOOR PLAN
M1.1	OF	10	MECHANICAL ATTIC PLAN

M2.0	OF	10	MECHANICAL PIPING FLOOR PLAN
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ELECTRICAL

E0.1	OF	12	ELECTRICAL LEGEND
E0.2	OF	12	ELECTRICAL SINGLE LINE DIAGRAM
E0.3	OF	12	ELECTRICAL PANEL SCHEDULES
E0.4	OF	12	ELECTRICAL DETAILS
E0.5	OF	12	ELECTRICAL DETAILS
E0.6	OF	12	ELECTRICAL DETAILS
E0.7	OF	12	ELECTRICAL DETAILS
E1.0	OF	12	FLOOR PLAN LIGHTING
E2.0	OF	12	FLOOR PLAN POWER
E3.0	OF	12	ELECTRICAL M&P CONNECTIONS FLOOR PLAN
E4.0	OF	12	FLOOR PLAN AUXILIARY
E5.0	OF	12	SITE PLAN ELECTRICAL

END OF SCHEDULE OF DRAWINGS

SECTION 01026 - UNIT PRICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Division 1 Specification sections, apply to this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for unit prices.
 - (1) A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.
 - (2) Refer to the individual Specification Sections for construction activities requiring the establishment of unit prices.
- B. Schedule: A "Unit Price Schedule" is included on the Bid Form. Specification Sections contain requirements for materials and methods described under each unit price.
 - (1) The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.01 UNIT PRICE SCHEDULE

- A. SEE BID FORM

END OF SECTION 01026

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - (1) Pre-Construction Conference.
 - (2) Pre-Installation Conferences.
 - (3) Progress Meetings.

1.03 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:

- Tentative construction schedule.
- Critical work sequencing.
- Designation of responsible personnel.
- Procedures for processing field decisions and Change Orders.
- Procedures for processing Applications for Payment.
- Distribution of Contract Documents.
- Submittal of Shop Drawings, Product Data and Samples.
- Preparation of record documents.
- Use of the premises.
- Office, Work and Storage areas.
- Equipment deliveries and priorities.
- Safety procedures.
- First Aid.
- Security.
- Housekeeping.
- Working Hours.

1.04 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the site before each major construction activity that requires coordination with other construction. The 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 the Owner and Architect of scheduled meeting dates.
- B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
 - Contract Documents.
 - Options.
 - Related Change Orders.
 - Purchases.
 - Deliveries.
 - Shop Drawings, Product Data and quality control samples.
 - Possible conflicts.
 - Compatibility problems.
 - Time schedules.
 - Weather limitations.
 - Manufacturer's recommendations.
 - Compatibility of materials.
 - Acceptability of substrates.
 - Temporary facilities.
 - Space and access limitations.
 - Governing regulations.
 - Safety.
 - Inspection and testing requirements.
 - Required performance results.
 - Recording requirements.
 - Protection.
- C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.
- D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.05 PROGRESS MEETINGS

- A. Conduct monthly progress meetings at the Project Site. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in

planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

- C. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - (1) Review the present and future needs of each entity present.
- D. Reporting: No later than 3 days after each monthly progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - (1) Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION 01200

SECTION 01300 - SUBMITTALSPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Division 1 Specification Sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

- Contractor's construction schedule.
- Daily construction reports.
- Shop Drawings.
- Product Data.
- Samples.

1.03 SUBMITTAL PROCEDURESA. ELECTRONIC SUBMITTAL PROCEDURES

- 1. Summary:
 - a. Shop drawing and product data submittals may be transmitted to Architect in electronic (PDF) format.
 - b. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - c. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
- 2. Procedures:
 - a. Submittal preparation – Contractor may use any or all of the following options:
 - 1. Subcontractors and Suppliers may provide electronic (PDF) submittals to the Contractor via email.
 - 2. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.
 - b. Contractor shall review and apply electronic stamps certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
 - c. Contractor may transmit each submittal to Architect in electronic format.
 - d. Architect / Engineer review comments will be made in electronic format and returned to the General Contractor with an electronic I.O.
 - e. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
 - f. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 07100 – Project Closeout.

3. Section 01300 - Administrative Requirements - Electronic Submittal Requirements as defined above are applicable to all technical sections of the specifications that require submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - (1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 - (2) Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Schedule: Prepare a fully developed, CPM-type Contractor's construction schedule. Submit within 30 days of the date established in the "Notice to Proceed" for commencement of the Work.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner's Representative, Subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
 - (1) When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.05 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect and Owner's Representative at bi-weekly intervals:
 - List of subcontractors at the site.
 - Approximate count of personnel at the site.
 - High and low temperatures; General weather conditions.
 - Accidents and unusual events.
 - Meetings and significant decisions.
 - Stoppages, delays, shortages, losses.
 - Meter readings and similar recordings.

Emergency procedures.
Orders and requests of governing authorities.
Change Orders received, implemented.
Services connected, disconnected.
Equipment or system tests and start-ups.
Partial Completion, occupancies.
Substantial Completions authorized.

1.06 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
 - Dimensions.
 - Identification of products and materials included.
 - Compliance with specified standards.
 - Notation of coordination requirements.
 - Notation of dimensions established by field measurement.
- C. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.07 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data included printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".
- B. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
 - (1) Do not permit use of unmarked copies of Product Data in connection with construction.

1.08 SAMPLES

- A. Submit fully-fabricated samples (full-size where appropriate) cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
- B. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

- C. Maintain sets of samples, as returned, at the Project Site, for quality comparisons throughout the course of the construction.

1.09 ARCHITECT'S ACTION

- A. Action Stamp: The Architect will stamp each copy of each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.
- B. Do not permit submittals marked "Revise and Resubmit" to be used at the Project Site, or elsewhere where Work is in progress.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports performed by independent agencies and governing authorities. They do not include Contract enforcement activities performed by the Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
 - (1) Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities.
 - (2) Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

1.03 RESPONSIBILITIES

- A. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
 - (1) The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform all inspections and tests specified, with the following exception:
 - (a) The Contractor will employ and pay for the services of an independent testing/balance agency, to provide testing, balancing and adjusting of HVAC equipment, as specified in a Division 15 Section.
- B. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - (1) The agency will not perform any duties of the Contractor.
 - (2) The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

- C. Retesting: The Contractor is responsible for the cost of retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
- D. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
- (1) Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 - (2) Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
 - (3) Providing facilities for storage and curing of test samples.
 - (4) Providing the agency with a concrete design mix proposed for use for material mixes that require control by the testing agency.
 - (5) Security and protection of samples and test equipment at the Project site.

1.04 SUBMITTALS

- A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Owner, Architect, and Contractor.
- (1) Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - (2) Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
 - X Date of issue.
 - X Project title and number.
 - X Name, address and telephone number of testing agency.
 - X Dates and locations of samples and tests or inspections.
 - X Names of individuals making the inspection or test.
 - X Designation of the Work and test method.
 - X Identification of project and Specification Section.
 - X Complete inspection or test data.
 - X Test results and an interpretation of test results.
 - X Ambient conditions at the time of sample-taking and testing.
 - X Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
 - X Name and signature of laboratory inspector.
 - X Recommendations on retesting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

- 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. Comply with Contract Document requirements for Cutting and Patching.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. This Section specified requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
 - (1) Obtain and pay for all building permits, fees and licenses required by AHJ (authorities having jurisdiction).
- B. Temporary utilities required include, but are not limited to:
 - (1) Temporary electric power and light.
 - (2) Telephone service (Cellular Service is acceptable).
 - (3) Water service and distribution.
- C. Temporary construction and support facilities include, but are not limited to:
 - (1) Temporary heat.
 - (2) Field office and storage sheds.
 - (3) Temporary roads and paving (Construction Entrances)
 - (4) Sanitary facilities, including drinking water.
 - (5) De-watering facilities and drains.
 - (6) Temporary enclosures.
 - (7) Hoists.
 - (8) Temporary project identification signs and bulletin boards.
 - (9) Waste disposal services.
 - (10) Rodent and pest control.
 - (11) Construction aids and miscellaneous services and facilities.
 - (12) Project Identification Sign
- D. Security and protection facilities include, but are not limited to:
 - (1) Temporary fire protection.
 - (2) Barricades, warning signs, and lights.
 - (3) Environmental protection.
- E. Related work specified elsewhere: "Erosion and Sedimentation Controls".

1.03 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
 - (1) Building Code requirements
 - (2) Health and safety regulations
 - (3) Utility company regulations
 - (4) Police, Fire Department and Rescue Squad rules
 - (5) Environmental protection regulations

- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series Standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".
 - (1) Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
 - (2) Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- C. Inspections: Arrange for AHJ (authorities having jurisdiction) to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.04 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough and Finish Carpentry".
 - (1) For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.
- C. Tarpaulins: Provide waterproofing, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

2.02 EQUIPMENT

- A. General: Provide new equipment; if acceptable to the Architect undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

- D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.
- G. Temporary Office: Provide prefabricated or mobile unit with lockable entrances, operable windows and serviceable finishes. Provide heated and air conditioned units on foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.
- I. First Aid Supplies: Comply with governing regulations.
- J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposure.
 - (1) Comply with NFPA 10 and 241 for classification, extinguishing, agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 INSTALLATION

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

3.02 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 - (1) Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
 - (2) Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - (3) Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.

- (4) Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.
- B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
 - (1) Sterilize temporary water piping prior to use.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.
 - (1) Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
 - (1) Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system, and will **provide adequate illumination for construction operations and traffic conditions.**
- E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period (cell phone service is acceptable).
 - (1) Post a list of important telephone numbers for persons having interest in this project, and for emergency services.
- F. Sewer and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
 - (1) Maintain temporary construction and support facilities until near substantial completion. Remove prior to substantial completion. Personnel remaining after substantial completion will be permitted to use permanent facilities under conditions acceptable to the Owner.
- B. Provide incombustible construction for offices, shops and sheds, located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
- C. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of complete installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize

consumption of energy.

- D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fueled oil heaters with individual space thermostatic control. (1) Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.
- E. Field Office: Provide insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the project site. Keep the offices clean and orderly for use for small progress meetings. Furnish and equip offices as appropriate to conduct business.
- F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs.
 - (1) Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
- G. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
 - (1) Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - (2) Install tarpaulins securely, with combustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.
 - (3) Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
- H. Collection and disposal of waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F (28 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.
- I. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division -2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.
- J. Project Identification and Temporary Signs: Prepare project identification and other signs. Install signs where directed to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
 - (1) Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
 - (2) Project Sign: Provide Project Identification Sign. Project sign to be painted on 4' x 8' x 3/4" th. Plywood and mounted on 4"x4" posts. Project sign text and layout will be provided by Addendum following award of Contract.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as required by the Architect.
- B. Temporary Fire Protection: Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
 - (1) Locate fire extinguishers where convenient and effective for their intended purpose.
 - (2) Store combustible materials in containers in fire-safe locations.
 - (3) Maintain unobstructed access to fire extinguishers, and access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
 - (4) Provide supervision of welding operations, combustion type temporary heating units and similar sources of fire ignition.
- C. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
- D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - (1) Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
 - (2) Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or not later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
 - (1) Materials and facilities that constitute temporary facilities are property of the Contractor.

END OF SECTION 01500

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL

- A. Upon completion of the project, the Contractor shall be required to furnish the following items to the Architect before approval of final payment will be made:
- (1) **All other special warranties required by the various specification sections.**
 - (2) Roofing Contractor's Five (5) Year Roofing Guarantee.
 - (3) One (1) Year Warranties on all materials, equipment and workmanship provided by subcontractors who may be employed under this Contract.
 - (4) As Built Record Drawings (2 Sets).
 - (5) Complete maintenance instructions for all items requiring maintenance at the building.
 - (6) Evidence that all indebtedness has been paid to subcontractors and material suppliers.
 - (7) Affidavit of Advertisement of Completion.
 - (8) **THESE ITEMS SHALL BE FURNISHED (THREE (3) SETS) ALL AT ONE TIME AND IN A NEATLY BOUND FORM.**

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

END OF SECTION 01700



MBA Engineers Inc – Geotechnical Department
2717 6th Avenue South, Birmingham, AL 35233

November 4, 2021

Tom McElrath
Thomas M. McElrath, Architect
717 Merit Springs Road
Gadsden, AL 35901

Subject: Final Report of Subsurface Exploration and
Geotechnical Engineering Evaluation
Southside Fire Station No. 1
Southside, Alabama
MBA Reference Number: G21-051.00

Dear Tom:

MBA Engineers has completed the authorized subsurface exploration and geotechnical engineering evaluation of the proposed Southside Fire Station No. 1 located in Southside, Alabama. Our services were performed in general accordance with the scope of services outlined in our Proposal Number G9094-21 dated September 9, 2021.

The purpose of our geotechnical study was to determine general subsurface conditions at widely spaced boring locations, and to gather information on which to base recommendations relative to site preparation, earthwork, and foundation design for the proposed fire station. As design of the project progresses, we suggest our office be contacted regarding geotechnical-related design, earthwork specifications and contract documents so we may provide additional input related to development-specific subsurface conditions.

We appreciate the opportunity to work with you and we look forward to assisting you through the design and construction phase of this project. If you have any questions or need any additional information, please call us.

Respectfully submitted,
MBA ENGINEERS, INC

Drew Thornbury, P.E.
Geotechnical Principal Engineer

Tucker Thomas
Geotechnical Staff Professional

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APPENDIX

BORING LOCATION PLAN

LOGS OF BORING

CBR LAB DATA

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

1.0 SCOPE OF SERVICES

The objective of the exploration is to provide site preparation and foundation recommendations for the proposed Southside Fire Station. Based on the objectives, the following services were conducted:

1. Site reconnaissance, test boring layout, geologic map review and mobilization of an ATV-mounted drill rig. Minimal site preparation was required by the City of Southside for access to the wooded portions on the west side of the site.
2. Soil Test Borings: Four (4) soil test borings located within the proposed building pad were extended to depths of 20.5 feet below the existing ground surface. Three (3) soil test borings located within the parking lot areas were extended to depths of 5.5 feet below the existing ground surface.
3. Laboratory Soil Classification Testing: Laboratory testing primarily focused on the general characteristics of the soils with an emphasis on the presence of highly plastic clays. A California Bearing Ratio (CBR) test was included to assist with pavement design.
4. Report Preparation: Engineering evaluation and geotechnical report including site preparation and foundation recommendations for the proposed Southside Fire Station. A pavement design has been included for the rigid and flexible pavement.

2.0 SITE AND PROJECT DESCRIPTION

The proposed Southside Fire Station site is located at 3170 Highway 77 in Southside, Alabama. Based on the Site Layout Plan (dated 7-8-21) provided by you, we understand the proposed Fire Station will be located to the west of Alabama State Route 77 and across the street from the New Season Assembly of God church. The proposed Fire Station is planned to be situated approximately 200 feet west of Highway 77, which primarily consists of dense vegetation and light wooded areas in the western portion of the site and landscaped grass on the eastern portion. Existing grades within the subject site range from approximately 576' in the southwest portion of the site to 588' within the northeast corner of the property. Based on review of historical imagery from Google Earth, a existing residence was previously located on the northeast portion of the site as late as 2015. Figure 1 shows the location of the proposed Southside Fire Station site.



Figure 1: Approximate Location of Southside Fire Station Outlined in Red

Proposed Construction: Construction will consist of an approximately 74' by 173', one story, Fire Station building with a bay wing for fire truck storage. Grading information was not provided at the time of this report; however, based on the existing grades, we anticipate cut and fill will be less than 2'. Based on our experience with similar buildings, column loads are expected to be less than 80 kips. In view of the Site Layout Plan, the driveway directly to the east and west of the truck bay of the building will be designed as a concrete pavement, and the remaining pavement areas will be designed as asphalt pavement.

3.0 SITE GEOLOGY

Published geologic maps (*Geologic Map of Alabama*, 1988) indicate that **Terrace Deposits** associated with the Coosa River are present at the subject site underlain by the **Conasauga Formation**. Terrace Deposits are described as unconsolidated silt and sand containing clasts of local bedrock and appear to be from the Coosa River watershed.

The **Conasauga Formation** typically consists of thin-to-medium-bedded limestone with thin partings of shale. The beds are usually folded and fractured. Weathering of the Conasauga formation typically results in a clayey or silty-clay soil with a highly irregular bedrock surface. Pinnacles may project to the surface, with limestone boulders and fragments occurring throughout the soil zone. The Conasauga Formation is also susceptible to vertical clay filled slots and seams in addition to the development of sinkholes. Figure 2 is an excerpt from the referenced map and the approximate subject site limits are outlined in red.

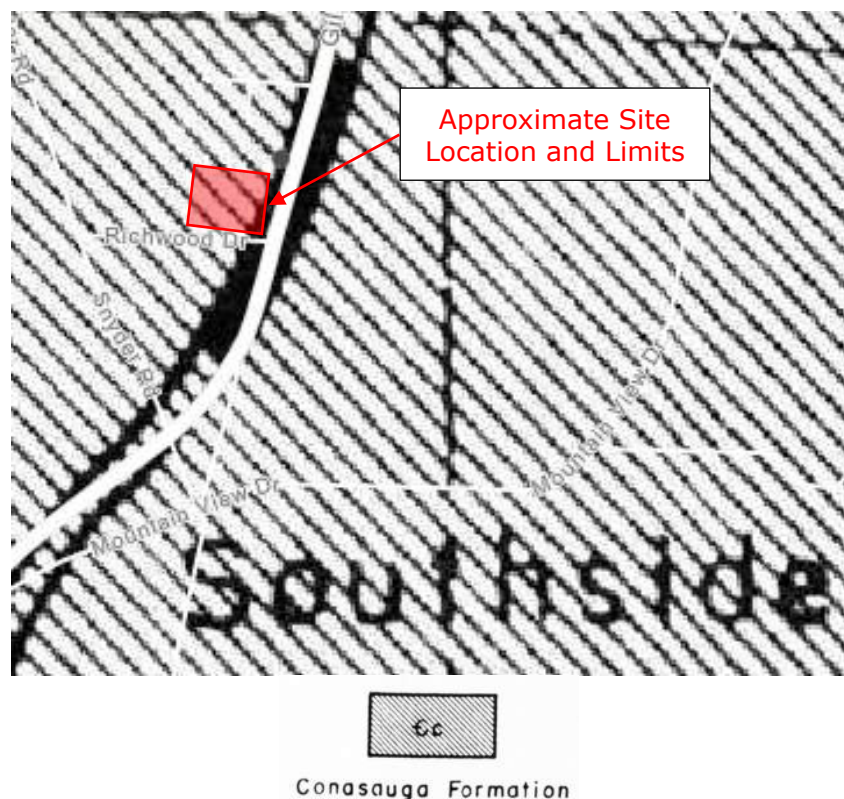


Figure 2: Excerpt from Geology Map of Etowah County, Alabama, dated 1961

Residual soils derived from the weathering of the limestone strata vary in thickness from a few feet to 50+ feet, resulting from the irregular configuration of the underlying limestone. Typically, residual soils derived from this formation are moderately to highly plastic. The water level follows the erratic rock profile and can vary over small distances. A zone of soft

soil is generally present several feet above the rock surface which is described as "karst disturbed soils".

3.1 SINKHOLE POTENTIAL

Because the Conasauga Formation is a carbonate rock formation, it is subject to dissolution; particularly along fractures, joints, and bedding planes. The rock dissolution is a very slow process and occurs over tens of thousands of years. The dissolution process tends to initially form vertical or steeply dipping slots in the carbonate rock. As water enters the slots and continues to dissolve the rock, the slots widen and can form sizeable cavities in the rock. Sinkholes may result when the overburden collapses or erodes into such voids.

Sinkholes are common in the Conasauga Formation due to the occurrence of solution cavities and zones of fracturing associated with the bedrock. Even an exploration consisting of many exploratory borings cannot determine with certainty whether a sinkhole will or will not occur during the service life of a project. Whether any future ground loss would occur at a given site is a function of existing voids in the carbonate rock beneath that site, fluctuation in the water table, and loss of soils into underground voids. **The owner should understand that there is always some risk associated with building over geologic formations that are prone to the formation of sinkholes. As a minimum, we recommend those entities associated with development of, or operations on the property pursue sinkhole coverage on their insurance policy.**

Karst disturbed soils were not observed in the borings; however, our scope of services did not include specific exploration to determine the presence of subsurface cavities or to determine sinkhole risk beneath the overall study area. Should the client so desire, a more comprehensive evaluation could be conducted in a separate exploratory program. However, even after an extensive exploration, the risk of a sinkhole developing during the service life of the development cannot be eliminated.

4.0 FIELD EXPLORATION

On October 7, 2021, a field exploration was conducted at the site consisting of seven (7) soil test borings. Four (4) borings (designated B-1 to B-4) were drilled in the proposed building pad and were extended to depths of 20.5'. Borings P-1, P-2, and P-3 were conducted in the parking lot areas and were extended to a depth on the order of 5.5'. The boring locations were determined by measuring and angling from existing site features, and the boring locations should be considered approximate.

The approximate boring locations are shown on the boring location plan in the Appendix. Conditions encountered at the boring locations represent conditions at the specific test locations at the time of exploration. It should be expected that conditions at other locations or at other times could differ from those observed and reported herein.

4.1 SOIL TEST BORINGS

Within each soil test boring, split-tube sampling, and Standard Penetration tests (SPT) were performed in accordance with ASTM D1586. The soil test borings were advanced by mechanically twisting continuous, hollow-stem auger flights into the ground. In the soil test borings, soil samples were obtained with a standard 2-inch O.D., 1.4-inch I.D., split-tube sampler. The sampler was first seated six inches to penetrate any loose cuttings and then driven one additional foot with blows of a mechanical hammer. The number of blows (N) required to drive the sampler the final foot of penetration is the standard penetration

resistance. The penetration resistance, when properly evaluated, is an index to the soil's strength, density, and ability to support foundations.

Representative portions of the samples obtained from the split-tube sampler were sealed in relatively airtight containers and transported to our laboratory. In the laboratory, the geotechnical engineer classified the samples. The Logs of Boring in the Appendix indicate the soil descriptions and penetration resistances.

Groundwater levels were measured during and immediately after the borings were drilled and are indicated on the attached Logs of Boring. The completed boreholes were backfilled promptly for safety reasons. Consequently, groundwater levels were evaluated for only a very short time.

4.2 LABORATORY TESTING

In addition to the field exploration, a laboratory-testing program was conducted to obtain data regarding the engineering characteristics of subsurface materials. Results of laboratory testing may be found on the attached boring logs. The following laboratory procedures were conducted:

- Atterberg Limits (ASTM D4318) were determined on select samples to evaluate how the soil characteristics change upon variations in moisture content. The soil Plasticity Index (PI) is representative of these characteristics and is the difference between the Liquid Limit (LL) and the Plastic Limit (PL).
- Materials in Soil Finer than the No. 200 Sieve (ASTM D1140) was determined on select samples to determine the percentage of fine-grained soils. The No. 200 sieve represents the break point between a material classified as coarse grained versus fine grained.
- Natural Soil Moisture Contents (ASTM D2216) were conducted on selected samples to determine the natural moisture content, which is the ratio, expressed as a percentage, of the weight of water in each amount of soil to the weight of solid particles.
- Standard proctor compaction test (ASTM D698) was performed on selected samples to determine the maximum dry density at the optimum moisture content. Standard proctors help determine the quality of the material proposed to be re-used as structural fill.
- California Bearing Ratio (CBR) (ASTM D1883) test is a load test applied to the surface of a prepared soil sample and the test results are used in soil investigations as an aid to the design of pavements. The laboratory test uses a circular piston to penetrate material compacted in a mold at a constant rate of penetration. The CBR is expressed as the ratio of the unit load on the piston required to penetrate 0.1 in. (2.5 mm) and 0.2 in (5 mm) of the test soil to the unit load required to penetrate a standard sample of well-graded crushed stone. A CBR test was performed on a composite soil sample obtained from the upper five feet of the soil profile from the borings drilled in the planned pavement areas.

5.0 SURFACE AND SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered by the borings are shown on the attached logs in the Appendix. The boring logs represent our interpretation of the subsurface conditions based upon examination of the split-spoon samples. Stratification lines on the logs represent approximate boundaries between soil types; however, the actual transition between soil types may be gradual.

Conditions represented by the logs should be considered applicable only at the boring locations on the dates shown, and it should be assumed that the conditions may be different at other locations or at other times. The general subsurface conditions encountered, and their pertinent characteristics are described in the following subsections.

5.1 SURFACE CONDITIONS

The proposed fire station is planned to be situated approximately 200 feet west of Highway 77. The eastern portion of the proposed building pad and development consisted of landscaped grass, and the western portion consisted of dense vegetation and wooded areas. The topsoil observed within the borings ranged from approximately 2" to 6" across the site. We anticipate the landscaped grass areas will have an average topsoil thickness of 4", and the wooded areas will have an average thickness of 8".

Due to the presence of some mature trees, the associated root mat under the trees would be expected to extend through the topsoil and into the underlying soil. The depth of the root mat will vary; however, root systems from mature trees can extend to depths greater than 24".

5.2 TERRACE DEPOSITS

Soils described as river terrace deposits from the Coosa River were encountered directly below the topsoil at each boring location and extended to depths ranging from 5.5' to 14.5' below the existing ground surface. Borings P-1, P-2, and P-3 were terminated at 5.5' prior to penetrating the terrace deposits.

The observed terrace deposits samples generally consisted of medium-dense to dense, light brown clayey sand or stiff to very stiff red-brown sandy clay with varying amounts of rock fragments. Standard penetration test (SPT) N-values within the terrace deposits ranged from four (4) to forty-three (43) bpf; however, typical values ranged from 11 to 29 bpf, indicating a medium to low consistency soil. N-values greater than 30 bpf were typically due to the presence of rock fragments resulting in an exaggerated N-value.

Low N-values of 4 and 6 were observed at B-1 and B-3, respectively, at the upper 1.5' to 3' sample. Pockets of upper medium to loose soil should be expected during mass grading.

Laboratory Testing: Laboratory test results of selected terrace deposited samples showed moisture contents ranging from approximately 12.3 percent to 25.0 percent. Classification testing was performed on selected terrace deposited samples at boring location B-2 at 7'. Additionally, classification testing was performed on a blended sample at boring locations P-1, P-2, and P-3. A summary of classification testing is shown below in **Table 1**.

Table 1: Summary of Classification Testing

Boring Location	Depth (ft)	Description	LL (Liquid Limit)	PI (Plasticity Index)	Percent Passing #200 Sieve
B-2	7'	Medium stiff, gray-tan, plastic clay	50	26	56.6%
Blended Sample at P-1, P-2, & P-3	2.5'	Tan, highly plastic clay	30	14	57.9%

In view of the classification testing, the selected soil samples would be considered a fine-grained material with low to moderate plastic properties. In addition, a Standard Proctor test was performed on the blended terrace deposited soils at P-1, P-2, and P-3. Results showed a maximum dry density of 116.1 pcf and an optimum moisture of 13.6%. In view of the CBR testing, the blended sample has a CBR value of approximately 4 at 2% wet of optimum.

5.3 RESIDUAL SOILS

Residual soils, or those soils formed by in-place weathering of the parent rock, were encountered directly below the terrace deposits at borings B-1 through B-4 located in the building pad. The borings located in the parking lot were terminated prior to observing residual soil.

The residual soils encountered generally consisted of stiff to very stiff, light brown or red-brown silty clay, underlain by decomposed shale. Standard penetration test (SPT) N-values in the residuum ranged from 7 to 17 bpf; indicating a high consistency soil. Laboratory test results of selected residual soil samples showed moisture contents ranged from 20.9 to 42.1 percent.

5.4 GROUNDWATER

During our exploration, groundwater was encountered at boring locations B-2 and B-3 at a depth of 13 feet. The perched water condition appears to be observed slightly above the terrace deposit and residual soil interface. The presence or absence of water in the borings during our exploration does not necessarily mean that groundwater would or would not be present at other times. Groundwater levels fluctuate seasonally and are related to the amount of rainfall during months prior to observations. Water is often trapped slightly above subsurface interfaces such as terrace deposits/ residual or residual/ rock and should be expected during mass grading. Groundwater is typically trapped above the rock surface and between rock pinnacles in carbonate rock formations.

6.0 SITE PREPARATION AND GRADING CONSIDERATIONS

The following considerations and recommendations are based on our understanding of the proposed construction and the subsurface conditions encountered during our limited subsurface exploration. We have developed our recommendations under the assumption that the sampling we performed on the subject site accurately portrays conditions that are otherwise concealed by earth, rock, water, and time. Responsible geo-professionals cannot finalize such recommendations until they confirm that the conditions they inferred to exist do exist, a process they perform in the field through observation of excavations. Accordingly, if we do not observe excavation to see what actually exist, we cannot accept responsibility for these recommendations, given that – if we observe conditions we did not expect to see – we would modify the recommendations.

6.1 GENERAL SITE PREPARATION

Grading information was not provided at the time of this report; however, based on the existing grades, we anticipate cut and fill will be less than 2'. Therefore, we anticipate that the following will have to be considered when developing the subject site:

- **Initial Site Clearing:** Site preparation should include removal of all topsoil, vegetation, and soil containing organic matter to a depth where uniform, stable subgrade conditions are encountered. Topsoil was encountered at each boring location ranging from two (2) to six (6) and should be expected throughout the site. We anticipate the landscaped grass areas will have an average topsoil thickness of 4", and the wooded areas will have an average thickness of 8". Root systems from mature trees should be expected to extend to depths greater than 24". Such a condition will require deep grubbing to remove organic soil and/or extensive roots.
- **Medium to Low Consistency Terrace Deposits:** Medium to low consistency terrace deposits were encountered at two (2) of seven (7) borings within the upper 3' of existing subgrade. Medium to low consistency soils will likely require stabilization for support of both the building pad and the proposed parking areas. Pockets of low consistency soils can be revealed by proofrolling with a fully loaded dump truck in the presence of a geotechnical engineer. In view of the anticipated subsurface conditions, we recommend the following for stabilization of low consistency soils:
 - **Building Pad Stabilization:** Stabilization in the building pad will likely require moisture conditioning and recompacting the onsite terrace deposit soils. We recommend undercutting soft clays until high consistency subgrade is observed, moisture conditioning the undercut material and exposed subgrade, and systematically replacing and compacting the undercut material back into the building pad in accordance with project specifications.
 - **Proposed Parking Areas:** Stabilization of the parking lot will be a function of the consistency of the subgrade. Typically, in light to medium duty parking lots, stabilization does not extend more than 24" below final subgrade elevations. Stabilization will likely require partial undercut to depths of 18" to 24" below final subgrade elevation, moisture conditioning the undercut material, and systematically replacing and compacting the undercut material back into the building pad.
 - **Unit Rates for Stabilization:** We recommend that both unit rate and quantity allowance provisions be included in the earthwork budget for excavation and

replacement of unsuitable soils as well as stabilization of low consistency soils. Methods of measurement and payment should be described in the specifications.

- **Subgrade Observation:** Following preparation of the subgrade, areas that are to receive engineered fill or construction of surface improvements, including pavements, should be evaluated by the geotechnical engineer. Such an evaluation will include proofrolling with a loaded dump truck or other heavy pneumatic tire-mounted construction equipment to reveal areas containing soft or loose soil. The geotechnical engineer can then determine the proper stabilization procedure to prepare a suitable subgrade. As a minimum, unit rates for undercut and replacing and moisture conditioning and recompacting should be included in the contract documents.

6.2 FILL PLACEMENT

Prior to placement of fill, we recommend any areas to receive fill should be proofrolled thoroughly by a loaded dump truck in the presence of the geotechnical engineer. Engineered fill placed at the site should be virtually free of organic matter and other deleterious materials and should be low plasticity (LL less than 50, PI less than 25 and a maximum dry density greater than 105 pcf). Rock fragments in the fill mass should be no greater than four (4) inches in greatest dimension following compaction. Based on classification testing, onsite soils can be reused as structural fill as long as the material is properly moisture conditioned.

Field Density Testing: A sufficient number of field density tests should be performed during fill placement to indicate whether the fill is in general compliance with the project specifications. A commonly used testing frequency is one test per lift of compacted fill per 2,500 square feet of fill area. Structural fill should be compacted to a minimum 98 percent of the maximum dry density obtained by a Standard Proctor compaction test. Fill moisture content should typically be in the range of ± 2 percent of optimum as determined by ASTM D698. Mass fills should be placed in maximum 8-inch loose lifts.

We recommend the grading contractor provide (well in advance of the start of site grading) us with representative samples of proposed off site borrow soil (if required) so tests can be performed to confirm compliance with the above structural fill recommendations. In general, soils with higher maximum dry densities and lower liquid limits and plasticity indices have better structural characteristics, are easier to moisture condition and compact, and will perform better than soils with lower maximum dry densities or higher liquid limits and plasticity indices.

6.3 LIMITED SPACE BACKFILLING

Backfilling around storm drains and within utility trenches must be performed in a controlled manner to prevent settlement of the fill and cracking of floor slabs and pavements supported by the backfill. The same level of care must be exercised when backfilling around below-grade structures such as manholes, junction boxes, etc. Backfilling around such structures typically involves placing and compacting fill in relatively confined spaces where manually operated equipment must be utilized for effective compaction of fill.

We recommend limited spaces be backfilled with acceptable fill in four-inch lifts and densified by mechanical compactors to the project requirements. Should seepage occur in excavation trenches, it may be necessary to "floor" the trench with open-graded crushed stone (compacted in lifts) to provide a dry working surface. Systematic compaction of limited space backfill will be required even if crushed stone backfill is used.

6.4 SITE DRAINAGE DURING AND POST CONSTRUCTION

Site grading plans should include positive drainage away from the structures, and the contractor should provide drainage during the construction period. Surface water should be diverted away permanently from the surface improvements. It may be necessary to install temporary interceptor ditches to collect and divert surface water away from the construction area.

Excessive twisting and turning of construction equipment have the potential to disturb the subgrade soils and may cause the need for near-surface soil remediation. Consequently, preparing/protecting the exposed subgrade prior to rain events will be particularly important if backfilling cannot be completed promptly and the upper soil would be vulnerable to strength loss from water ponding. We recommend the project specification address the contractor's responsibility to maintain controlled site drainage during construction.

7.0 FOUNDATION RECOMMENDATIONS

Based on conversations with Keith Owens with MBA Engineers maximum column loads are expected to be on the order of 80 kips. Considering the structural loads and the soils that our exploratory borings encountered under the proposed building footprint, it is our opinion that spread and strip footings would be an appropriate foundation system for support of the planned building. *The use of spread footings assumes that all recommendations in the site preparation section are followed including stabilizing pockets of low consistency soils.*

Foundation Construction Consideration: Foundations bearing on high consistency, *terrace deposits* can be designed for a maximum allowable bearing capacity of 3,000 psf. Additionally, we recommend that the following items be incorporated into the building foundation design:

- Minimum footing dimensions of 18 inches are recommended for continuous strip footings. Column footings should have a minimum dimension of 24 inches.
- Pockets of organic or low consistency soils encountered during footing excavation should be fully penetrated to reach the high consistency soils for proper bearing. As discussed previously, pockets of medium to low consistency terrace deposited soils may be observed during footing construction that will require over excavation. Footing over excavation can be backfilled with lean concrete to the original bottom of footing elevation.
- *It is recommended that all footing bearing surfaces be compacted by a manually operated piston type tamper or vibratory plate compactor prior to placement of the reinforcing steel and observation by the geotechnical engineer.* We suggest that bearing surface compaction be addressed in the foundation notes.
- Soil exposed in the base of all satisfactory foundation trenches should be protected against any detrimental change in conditions such as disturbance from rain, frost, or flooding. Surface runoff water should be drained away from the excavations and not be allowed to pond during construction.
- All footing concrete should be placed during the same day the excavation is made. If this is not possible, then the footing excavation and bearing surface should be adequately protected using a 'mud mat' or other suitable means.
- Roof drainage should be routed away from the structure by positive drainage. Roof runoff

should be directed away from the foundation areas and discharged a minimum of 5' away from the foundations with a positive slope away from the building.

- Limiting water intrusion around the building perimeter will be important. Applying "hardscape" such as sidewalks adjacent to the building's exterior walls is preferred to landscaped areas that require regular irrigation. Moisture penetration under slabs and foundation areas will be detrimental to the bearing capacity of the onsite soils.

8.0 FLOOR SLAB SUPPORT CONSIDERATIONS

Based on the subsurface conditions, the buildings may be supported on-grade if recommendations made in the Site Preparation section are followed. We recommend the ground-supported slab should be constructed over a minimum four (4) inches of vibro-compacted open-graded granular materials (such as ALDOT #57 stone) to achieve more uniform support and provide a capillary break.

Care should be taken so that fines are not allowed to contaminate the capillary break. If fines contaminate the stone, capillary rise and subsequent damage to moisture sensitive floor covering could occur. Moisture penetration through the slab and subsequent wetting of walls, carpets etc. can also result in other problems such as mold contamination.

We recommend that just prior to the placement of the sub-slab gravel layer, a geotechnical engineer evaluate the condition of the floor slab subgrade. The evaluation may include proofrolling with a loaded dump truck or other heavy, pneumatic-tire mounted construction equipment. Should proofrolling reveal subgrade that deflects significantly, the area containing the loose or soft soil should be improved to a non-yielding/stable condition by scarification, aeration, and recompaction, or undercutting and replacement.

The use of a vapor retarder directly beneath the slab should be at the discretion of the project architect, who can determine the potential impact of water vapor (passing through the slab) on floor finishes, adhesives, and building contents. Our geotechnical evaluation did not include any evaluation for determining the potential for mold growth inside the building due to the observed subsurface conditions and the site development plan.

On most projects, there is some delay between initial grading and the time when the contractor is ready to construct the slab-on-grade. Exposure to wet weather, construction traffic, etc., can destroy the integrity of subgrade soil. We suggest that provisions be included in the project specifications for the contractor to restore the floor slab subgrade soils to an acceptable condition prior to the construction of floor slabs. Subgrade restoration can be challenging (and a source of controversy) if the gravel sub-slab layer is placed early in the construction process, rainwater becomes trapped in the under slab gravel, and construction traffic contributes to rutting of the nearly completed pad.

Based on our experience, wide joint spacing is a common reason for floor slab cracking. We recommend that joint spacing and construction follow Portland Cement Association (PCA) and ACI guidelines. Any crack control steel (including wire mesh) included in the slab should be supported permanently in its proper position in the slab during concrete placement to gain maximum benefit. Slab thickness design recommendations and establishing a slab joint pattern were not within our scope of services.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage cracking or curling of the slabs. Again, we suggest that concrete placement and curing operations be performed in accordance with ACI guidelines.

9.0 PAVEMENT DESIGN

In view of the Site Layout Plan, the driveway directly to the east and west of the truck bay of the building will be designed as a concrete pavement, and the remaining pavement sections will be designed as flexible asphalt pavement. In view of the CBR testing, the blended sample has a CBR value of approximately 4 at 2% wet of optimum. Based on the anticipated site conditions and the proposed site preparation recommendations, we have utilized a resilient modulus (M_r) of 6,000 psi in design calculations for pavement analysis. The design resilient modulus value is assuming all site preparations recommendations for the pavement sections are followed including moisture conditioning and recompacting low consistency onsite soils. In fill areas, all material should be compacted to a minimum 98 percent of standard proctor (ASTM D698) within 2 percentage points of the soil's optimum moisture content.

Traffic Loading Information: Based on our understanding of the project, we have assumed the following traffic loads for the project. Note: If the anticipated traffic loads are going to be different than the assumed values, the pavement design may need to be adjusted:

- **Standard Duty Asphalt Pavement:** We have assumed the overwhelming majority of traffic will consist of passenger vehicles; however, fire trucks will access the truck bay through the eastern and western flexible pavement. For design purposes, we have assumed one (1) fire truck per day over the asphalt pavement. Based on the anticipated use and assuming a design life of 15 years, the standard duty flexible pavement will be designed for 25,000 ESALs (equivalent single axle loads) over the life span of the parking lot.
- **Heavy Duty Rigid Pavement:** A heavy duty rigid pavement will be required to the east and west of the fire station, and traffic loads will consist of fire trucks multiple times per day. For estimating purposes, we assumed a traffic of one (1) fire trucks per day over the pavement section. According to ACI 330 Design Guidelines, entrance and exit lanes for a fire truck would be considered a Traffic Category "C".

9.1 FLEXIBLE PAVEMENT DESIGN

The asphalt pavement section described herein was designed using the AASHTO "Structural Number" (SN) System. Table 2 is the "structural equivalency coefficient" recommended by the Alabama Department of Transportation (ALDOT) values and the reference locations can be found in Table 3.

Table 2: ALDOT Flexible Pavement References

Material	Structural Equivalency Coefficient
Asphalt Concrete	0.44
Crushed Stone Base	0.14

All subgrade, base, pavement construction operations and materials should meet minimum requirements of the ALDOT *Standard Specifications for Highway Construction*, 2018 edition.

Table 3: ALDOT Flexible Pavement References

Title	ALDOT Division
Base & Sub-base Courses	300 (pp. 3-1 to 3-20)
Asphalt Pavements	400 (pp. 4-44 to 4-55)
Materials	800 (pp. 8-1 to 8-119)

It is important to note that the recommended pavement sections do not address construction traffic. Medium construction traffic such as concrete trucks or loaded dump trucks would apply wheel loads that would exceed those assumed in our pavement design and could lead to premature distress, particularly if construction traffic crosses partially complete pavements. Table 4 shows the AASHTO Design Parameters, and Table 5 shows the standard-duty pavement designs.

Table 4: AASHTO Design Parameters

PAVEMENT SECTION	M_r Design Value = 6,000 psi Standard Deviation (S_o) = 0.5 (Flexible) Reliability (R) = 85% Initial Serviceability = 4.5 Terminal Serviceability = 2.0 Standard Normal Deviate (Z_r) = -1.037 Subgrade Drainage Coefficient = 1.0
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Table 5: Standard-Duty Flexible Pavement Design - 25,000 ESAL's.

STRUCTURAL NUMBER PROVIDED = 2.12	
DESIGN SECTION	1-inch Asphalt Wearing Surface, ALDOT 424-A ¹ 2-inch Asphalt Binder Course, ALDOT 424-B 6-inch Crushed Stone Base, ALDOT 825B

9.2 RIGID PAVEMENT DESIGN

Rigid pavement sections were designed using the ACI 330 Method and the StreetPave Software. The rigid pavement designs were developed based on a subgrade a resilient modulus (M_r) of 6,000 psi. Concrete strength at 28-days should be 4,500 pounds per square inch (psi), for a modulus of rupture of 650 psi. The entrance and exit lanes for the fire trucks have been designed as a Traffic Category "C". All subgrade, base course, and pavement construction operations and materials should meet minimum ACI requirements. Base course should be compacted to a minimum 98 percent of the Modified Proctor (ASTM 1557) maximum dry density.

American Concrete Institute (ACI) literature indicates reinforcing is typically not necessary in concrete pavements if a proper joint pattern is used in design and quality workmanship (including finishing and prompt joint placement) is conducted. ACI recommends joint spacing (to reduce random cracking) no greater than 15 feet for concrete pavements greater than six inches thick. However, some rigid pavement designers, when dealing with pavements that will be subjected to repeated medium traffic, such as at the subject site, prefer installing dowels across the pavement joints to provide better load distribution. Table 6 shows the AASHTO Design Parameters, and Table 7 shows the standard duty rigid pavement design.

¹ Pavement materials are from the ALDOT Standard Specifications for Highway Design 2018 Edition

Table 6: Summary of Design Parameters

PAVEMENT SECTION	ACI 330 Traffic Category "C" M _r Design Value = 6,000 psi Standard Deviation (S _o) = .35 (Rigid) Reliability (R) = 85% Initial Serviceability = 4.5 Terminal Serviceability = 2.0 Subgrade Drainage Coefficient = 1.0
-------------------------	--

Table 7: Rigid Pavement Design

CONCRETE PAVING	
DESIGN SECTION	6.0-inches Portland Cement Concrete Pavement (f' _c = 4,500 psi at 28 days) 4.0-inches Crushed Stone Base, ALDOT 825B

9.3 PAVEMENT SUBGRADE CONSIDERATIONS

Because the performance and durability of the pavement primarily depends on the support provided by the underlying subgrade material, use of proper soils, compaction and subgrade preparation are the most important element in pavement design and construction. For flexible (asphaltic concrete) pavements, bases and sub-bases provide uniformity of support and strength to distribute the load to the underlying soil over an area greater than the contact area of the tire. The weaker the underlying soil, the greater is the required area of load distribution and greater the required pavement thickness.

Fine grained, plastic soils have detrimental volume change characteristics due to changes in soil moisture content. Silts are susceptible to rutting and pumping upon saturation and may remain susceptible to pumping due to capillary action after paving. Any moisture sensitive soils encountered should be modified by stabilizing agents or undercutting and replacement with better materials. Problems often occur when such soils are present in pockets and also when transitioning from cuts to fills.

9.4 SUBGRADE DRAINAGE

Pavements fail for many reasons, including improper construction, design, or materials. However, one very important cause of failure is poor drainage of the subgrade. Poor drainage, according to AASHTO accounts for 60 percent of all pavement failures. The material under the structural element (asphaltic concrete or PCC) is usually a dense-graded granular base. Such bases are not usually free draining and can become saturated. Saturation of the subgrade and granular base leads to a reduction in load bearing strength and the potential for deformation. Water penetration under the pavement can occur from various sources and we recommend the pavement be designed to prevent the following:

- Ingress via cracks and joints or from unpaved permeable adjoining areas.
- Water pooling at the edges of the pavement and curbs and entering the granular base.
- Excessive runoff from landscape planters or lawn areas.
- Utility lines under the paving.
- Lack of slope on pavement causing pooling on the surface.

Poor draining subgrades such as silts and clays can cause a layer of water to form at the base

course/subgrade interface, forming mud slurry. The sensitivity of the subgrade to changes in moisture content depends on the soil composition. Sandy soils are affected least because they have good drainage properties. Silty soils commonly exhibit significant reduction in strength when wetted. When dealing with clay subgrades, both the soil volume and strength can be impacted by an increase in soil water content. Installation of edge drains, interceptor drains and longitudinal drains are measures often considered in pavement design when enhanced drainage is warranted.

9.5 SUBGRADE PROTECTION AND NEWLY CONSTRUCTED PAVEMENTS

Often after the pavement subgrade has been moisture conditioned and prepared, construction traffic and inclement weather cause disturbance of the upper soil. It is essential that the subgrade be restored to a non-yielding condition slightly prior to placement of the pavement base course. Further, the aggregate base course should not be exposed to multiple rain events or freezing temperatures because the strength of the base course can be reduced.

It is a common practice to place pavement binder courses prior to building construction being complete. As a result, heavy traffic associated with construction often crosses incomplete or light-duty parking areas, or the pavements are used as material storage or staging areas, causing rutting and cracking of the partially-completed paving section. The need to treat premature pavement failures associated who was responsible to repair the failed pavement. It is recommended that construction traffic be prohibited from crossing any light-duty or partially-completed pavements, and that designated construction traffic lanes are identified, thereby reducing the amount of binder course that will have to be patched prior to application of the pavement wearing course

10.0 CONSTRUCTION OBSERVATION AND TESTING

Because geotechnical engineering is an inexact science due to the variability of natural processes, and because we sample only a limited portion of the soils affecting the performance of the proposed site improvements, unanticipated or changed conditions can be encountered during site grading and excavations. We recommend the owner retain MBA Engineers to provide a comprehensive construction-testing program to assist in determining that certain aspects of construction are being carried out in general conformance with the project plans and specifications.

Construction testing commonly includes testing of construction materials such as compacted fill and concrete, inspection of structural steel and wood framing, and engineering observations and testing during the earthwork and foundation construction portions of the project. In addition, Special Inspections, in accordance with the International Building Code (IBC) are usually required during the construction of most structures other than single-family homes. According to current industry practice, if MBA is not retained to provide construction phase observation and testing services, we will cease to be the engineer of record for the project and will assume no responsibility for any potential claim during or after construction of the project.

Engineering observation and materials testing during the earthwork and foundation construction phases is particularly important because assumptions (and recommendations) have been made based on the soil boring and test pit findings. Comprehensive geotechnical observation and testing during construction are essential to allow the design engineer the opportunity to confirm that actual subsurface conditions are comparable to the assumed conditions. In actuality, observation during the site preparation, earthwork, and foundation installation phases is an essential part of the subsurface exploration process. Failure to

engage the design geotechnical engineer to provide field observation during earthwork and foundation construction would result in an incomplete subsurface exploration and could increase the owner's risk of delays, change orders, and disputes.

We recommend that MBA be retained by the owner to provide a comprehensive geotechnical observation and construction materials testing program to assist the owner in determining whether certain aspects of construction are carried out in general conformance with the project-specific plans and specifications. The recommended *quality assurance* program would be for the owner's benefit and would not be intended to serve the quality control function for which the general contractor would be responsible. Inspection and testing would be done solely for the owner's benefit and would not relieve the contractor of his contractual obligation to meet the project specification requirements. The contractor would be responsible for his own quality control function, regardless of whether independent testing is conducted by the owner's representative.

11.0 GENERAL REMARKS AND LIMITATIONS

This report has been prepared for the exclusive use of **Mr. Tom McElrath with Thomas M. McElrath, Architect** for specific application to the subject project and is non-transferable to any third party without prior consent from MBA Engineers. All recommendations contained in this report have been made in accordance with generally accepted soil and foundation engineering practices in the area where the services were performed. No other warranties are implied or expressed.

At the time this report was prepared, no grading plan had been provided, and consequently the report may not address all geotechnical-related design issues. In addition, the analysis and recommendations submitted in this report are based, in part, upon the data obtained from a limited number of borings. The nature and extent of variations in soil conditions between the borings may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report

The information contained in this report is not intended, nor is sufficient, for the design of segmental retaining walls. Segmental wall designers/builders should perform independent analysis to determine all necessary soil characteristics (including soil shear strength and bearing capacity) used in wall design. Also, the geotechnical engineer in charge of this project is not a mold prevention consultant; none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention.

It is important that the geotechnical engineer be provided the opportunity to review the final geotechnical related plans and specifications to provide a level of confidence that the recommendations in this report were properly interpreted and incorporated in the design. It will be the client's responsibility to furnish the final grading and foundation plans to MBA Engineers for the necessary review. *If the geotechnical engineer is not accorded the privilege of making this recommended review, he can assume no responsibility for misinterpretation of the recommendations in this report.*

The information contained in this report is for the benefit of the client and to aid the other project professionals in planning and design of the subject project. The report is not intended to serve as a contract document and should not be used as a substitute for a project-specific earthwork or foundation specification. Instead, the input herein should be interpreted and applied to the appropriate specification sections.

An article published by the Geoprofessional Business Association (GBA), titled Important Information About Your Geotechnical Report, has been included in the Appendix. We encourage all individuals to become familiar with the article to help manage risk.



LOG OF BORING

BORING LOCATION: B-1

Project Name: Southside Fire Station No. 1

Project Number: G21-051

Drilling Method: HSA

Equipment Used: ATV

Hammer Type: Automatic

Project Location: Southside, AL

Date Drilled: Oct-07-2021

Weather: Clear

Logged By: TT

Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE DATA										NOTES:
			SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	
0		3" Topsoil											
		Loose, light brown, clayey sand with trace rock fragments	1	⊗	2 - 2 - 2	4	20.0						
5		Dense, red to light brown, rocky clay and sand	2	⊗	6 - 14 - 29	43*	17.6						* = Exaggerated due to chert fragments
		Dense, light brown, rocky sand (Terrace Deposits)	3	⊗	7 - 12 - 19	31*	14.1						* = Exaggerated due to chert fragments
10		Stiff, light brown, silty clay	4	⊗	7 - 3 - 7	10	24.7						
15		Stiff, light brown, clay	5	⊗	2 - 3 - 4	7					1.25		
20		Gray, decomposed shale (Residuum)	6	⊗	4 - 6 - 9	15							
		Boring Terminated at 20.5'											GNE
25													

	Split Spoon Sample		No Recovery		Water Table Encountered @ Time of Drilling	GNE = Groundwater Not Encountered
	Grab Sample		Rock Coring		Delayed Water Table Level	LL = Liquid Limit
						PL = Plastic Limit
						PI = Plasticity Index



LOG OF BORING

BORING LOCATION: B-2

Project Name: Southside Firestation #1

Project Number: G21-051

Drilling Method: HSA

Equipment Used: ATV

Hammer Type: Automatic

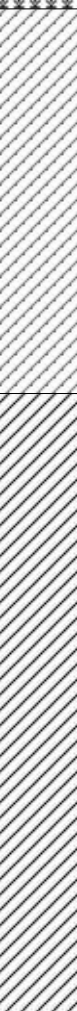






Project Location: Southside, AL

Date Drilled: Oct-07-2021

Weather: Clear

Logged By: TT

Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE DATA										
			SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	NOTES:
0		3" Topsoil											
		Stiff, red-brown, sandy clay	1		4 - 5 - 6	11	18.3						
5		Very stiff, red to light brown sandy clay	2		6 - 9 - 16	25	22.0						
		...same... (Terrace Deposits)	3		8 - 12 - 10	22	21.9	50	24	26		Percent Passing #200 Sieve = 56.6%	
10		Light brown, sandy clay with light gray silty clay	4		4 - 5 - 6	11	20.9						
15		Very moist, light brown plastic clay	5		3 - 4 - 4	8	42.1				1.25		
20		Stiff, light brown, clay (Residuum)	6		5 - 6 - 8	14					1.25		
	Boring Terminated at 20.5'												
25													



Split Spoon Sample



No Recovery



Water Table Encountered
@ Time of Drilling



Delayed Water Table Level



Grab Sample



Rock Coring

GNE = Groundwater Not Encountered

LL = Liquid Limit

PL = Plastic Limit

PI = Plasticity Index



LOG OF BORING

BORING LOCATION: B-3

Project Name: Southside Firestation #1

Project Number: G21-051

Drilling Method: HSA

Equipment Used: ATV

Hammer Type: Automatic

Project Location: Southside, AL

Date Drilled: Oct-07-2021

Weather: Clear

Logged By: TT

Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE DATA										NOTES:
			SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	
0		4" Soft, light gray sandy silt											Topsoil
		Medium-stiff, light brown, clayey sand	1	⊗	2 - 2 - 4	6	16.1						
5		Stiff, light to red-brown, silty clay	2	⊗	4 - 5 - 10	15	25.0				2.25		
		Dense, light brown, silty to clayey sand	3	⊗	10 - 14 - 15	29	18.4						
10		...sand... (Terrace Deposits)	4	⊗	11 - 14 - 16	30*	16.7						* = Exaggerated due to chert fragments
15		Stiff, light brown, clay with little sand	5	⊗	13 - 9 - 8	17					2.75		
		Moist, sandy clay											
20		Gray, highly decomposed shale (Residium)	6	⊗	6 - 6 - 8	14							
		Boring Terminated at 20.5'											
25													



Split Spoon Sample



No Recovery



Water Table Encountered
@ Time of Drilling



Delayed Water Table Level



Grab Sample



Rock Coring

GNE = Groundwater Not Encountered

LL = Liquid Limit

PL = Plastic Limit

PI = Plasticity Index



LOG OF BORING

BORING LOCATION: B-4

Project Name: Southside Firestation #1

Project Number: G21-051

Drilling Method: HSA

Equipment Used: ATV

Hammer Type: Automatic

Project Location: Southside, AL

Date Drilled: Oct-07-2021

Weather: Clear

Logged By: TT

Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE DATA										NOTES:
		APPROX. SURFACE ELEV: n/a-ft	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	
0		4" Topsoil											
		Medium-dense, light brown, clayey sand	1		2 - 4 - 5	9	13.6						
5		Very stiff, silty to sandy clay	2		5 - 9 - 15	24	18.2						
		Very stiff, red to light brown sandy clay	3		8 - 12 - 16	28	23.8						
10		...with gray silty sand seam	4		3 - 5 - 8	13							
		Dense, light brown sand (Terrace Deposits)	5		9 - 13 - 5	18							
15		Stiff. red-brown, plastic clay											
20		...same... (Residuum)	6		4 - 5 - 7	12							
		Boring Terminated at 20.5'											GNE
25													



Split Spoon Sample



No Recovery



Water Table Encountered
@ Time of Drilling



Delayed Water Table Level

GNE = Groundwater Not Encountered

LL = Liquid Limit

PL = Plastic Limit

PI = Plasticity Index



LOG OF BORING

BORING LOCATION: P-1

Project Name: Southside Firestation #1

Project Number: G21-051

Drilling Method: HSA

Equipment Used: ATV

Hammer Type: Automatic

Project Location: Southside, AL

Date Drilled: Oct-07-2021

Weather: Clear

Logged By: TT

Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE DATA										NOTES:
			SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	
0		2" Topsoil											
		Medium-stiff, light brown, silty clay	1	☒	8 - 2 - 5	7							
		Very stiff, red to light brown sandy clay (Terrace Deposits)	2	☒	6 - 10 - 15	25							
5		Boring Terminated at 5.5'											GNE
10													
15													
20													
25													



Split Spoon Sample



No Recovery



Water Table Encountered
@ Time of Drilling



Delayed Water Table Level



Grab Sample



Rock Coring

GNE = Groundwater Not Encountered

LL = Liquid Limit

PL = Plastic Limit

PI = Plasticity Index



LOG OF BORING

BORING LOCATION: P-2

Project Name: Southside Firestation #1

Project Number: G21-051

Drilling Method: HSA

Equipment Used: ATV

Hammer Type: Automatic

Project Location: Southside, AL

Date Drilled: Oct-07-2021

Weather: Clear

Logged By: TT

Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION APPROX. SURFACE ELEV: n/a-ft	SAMPLE DATA										NOTES:
			SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	
0		2" Topsoil											
		Stiff, light brown, silty clay	1		3 - 6 - 5	11	12.3						
5		Very stiff, red-brown to light brown sandy clay (Terrace Deposits) Boring Terminated at 5.5'	2		6 - 13 - 20	33	18.9						
10													GNE
15													
20													
25													



Split Spoon Sample



No Recovery



Water Table Encountered
@ Time of Drilling



Delayed Water Table Level



Grab Sample



Rock Coring

GNE = Groundwater Not Encountered

LL = Liquid Limit

PL = Plastic Limit

PI = Plasticity Index



LOG OF BORING

BORING LOCATION: P-3

Project Name: Southside Firestation #1
Project Number: G21-051
Drilling Method: HSA
Equipment Used: ATV
Hammer Type: Automatic

Project Location: Southside, AL
Date Drilled: Oct-07-2021
Weather: Clear
Logged By: TT
Drill Crew: South Brothers

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE DATA										NOTES:
		APPROX. SURFACE ELEV: n/a-ft	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	
0		6" Topsoil											
		Medium-dense, light brown, clayey sand	1	☒	4 - 8 - 8	16	12.4						
5		Dense, cherty sand (Terrace Deposits)	2	☒	14 - 29 - 20	49*	15.2						* = Exaggerated due to chert fragements
		Boring Terminated at 5.5'											GNE
10													
15													
20													
25													



Split Spoon Sample



No Recovery



Water Table Encountered
@ Time of Drilling



Delayed Water Table Level



Grab Sample



Rock Coring

GNE = Groundwater Not Encountered

LL = Liquid Limit

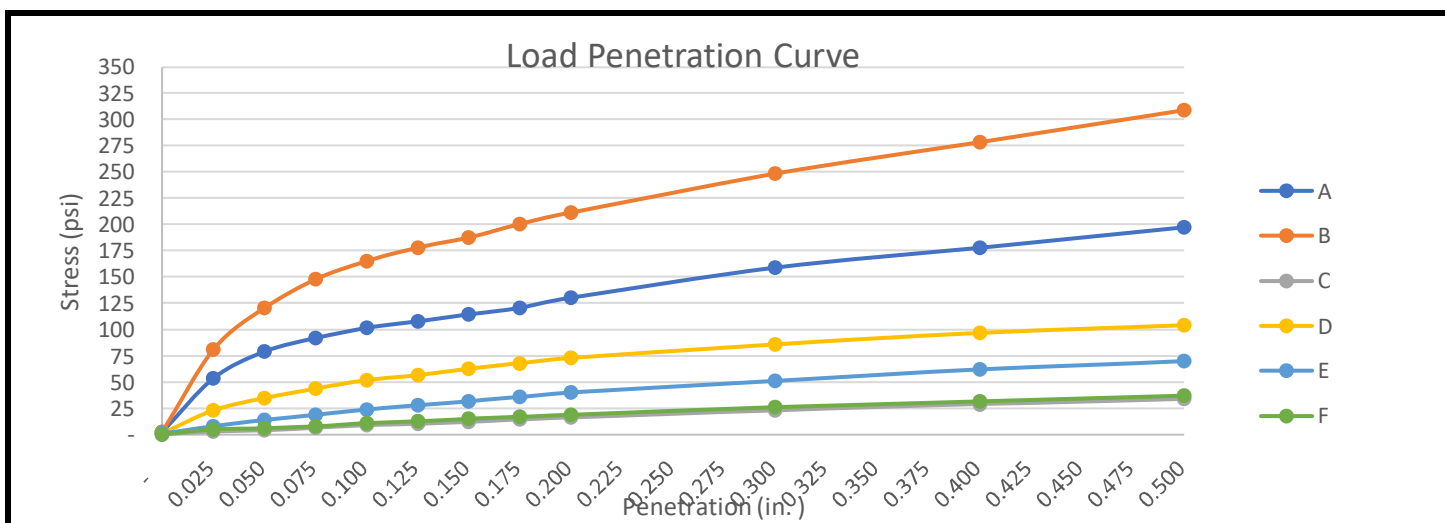
PL = Plastic Limit

PI = Plasticity Index

**Standard Test Method for
California Bearing Ratio (CBR) of Laboratory-Compacted Soils**
 ASTM - D1883-16

Project Name:	Southside Fire Station #1	Report Number	E210025.01_CBR
Project Number:	G21051.00	Report Date:	October 27, 2021
Project Location:	Southside, AL	Group / Sample ID:	E21-0025
Sample Description:	(Blend) Tan-Brown, sandy-CLAY	Sample No.:	1
		Depth:	2.0-ft

Penetration Data		A		B		C		D		E		F	
Penetration	Cor. Factor	Dial (in)	Stress (psi)	Dial (in)	Stress (psi)	Dial (in)	Stress (psi)	Dial (in)	Stress (psi)	Dial (in)	Stress (psi)	Dial (in)	Stress (psi)
-		1.0	2.45	1.0	2.45	0.5	0.85	1.5	4.05	1.0	2.45	-	(0.75)
0.025		17.0	53.65	25.5	80.83	3.0	8.85	23.0	72.84	8.0	24.86	5.0	15.26
0.050		25.0	79.23	38.0	120.78	4.5	13.66	35.0	111.20	14.0	44.05	6.0	18.46
0.075		29.0	92.02	46.5	147.93	6.5	20.06	44.0	139.95	19.0	60.05	8.0	24.86
0.100	1,000	32.0	101.61	52.0	165.49	9.0	28.06	52.0	165.49	24.0	76.04	11.0	34.46
0.125		34.0	108.00	56.0	178.26	10.5	32.86	57.0	181.45	28.0	88.82	13.0	40.86
0.150		36.0	114.39	59.0	187.83	12.0	37.66	63.0	200.59	32.0	101.61	15.0	47.25
0.175		38.0	120.78	63.0	200.59	14.5	45.65	68.0	216.54	36.0	114.39	17.0	53.65
0.200	1,500	41.0	130.36	66.5	211.76	16.5	52.05	73.0	232.49	40.0	127.17	19.0	60.05
0.300		50.0	159.10	78.0	248.43	23.5	74.44	86.0	273.93	51.5	163.89	26.0	82.43
0.400		56.0	178.26	87.5	278.71	29.0	92.02	97.0	308.97	62.0	197.40	32.0	101.61
0.500		62.0	197.40	97.0	308.97	34.0	108.00	104.0	331.25	70.0	222.92	37.0	117.59
CBR Data		A		B		C		D		E		F	
CBR @ 0.100"		10.2		16.5		2.8		16.5		7.6		3.4	
CBR @ 0.200"		8.7		14.1		3.5		15.5		8.5		4.0	
Wet Unit Weight (pcf):		123.3		129.1		129.2		130.6		132.1		130.6	
Dry Unit Weight (pcf):		111.6		114.8		111.0		115.6		115.5		113.3	
WC (%) As Compacted:		10.5%		12.5%		16.4%		13.0%		14.4%		15.3%	
WC (%) after Soaking:		18.1%		17.1%		16.5%		14.6%		15.4%		15.9%	
Swell (%):		0.5%		0.2%		0.0%		0.1%		0.0%		0.2%	
Hours:		94.0		94.0		94.0		97.3		97.3		97.3	



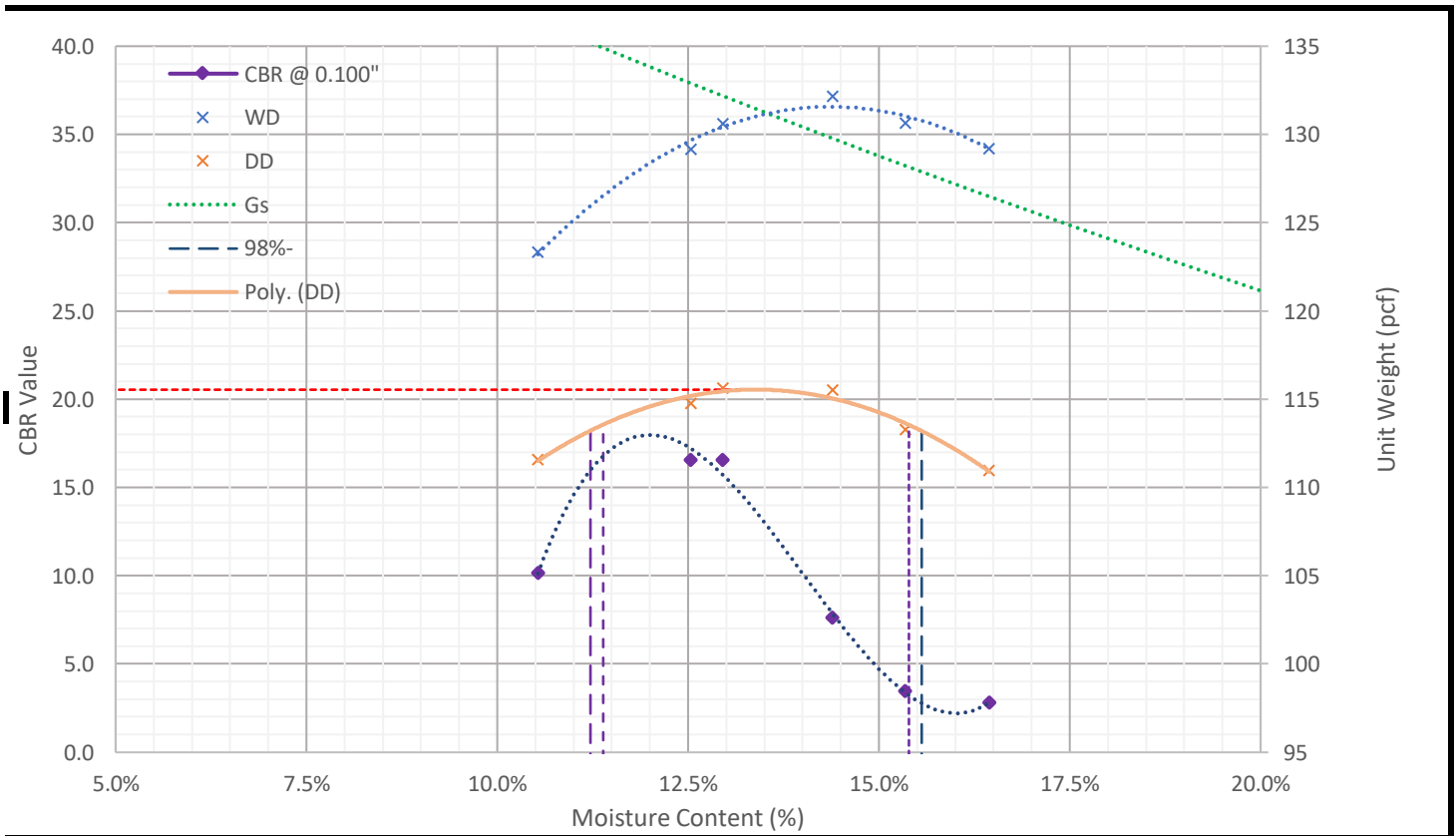
Test Performed By: M. Angwin
Title: Lab Technician
Date Test Began: October 22, 2021
Date Test Complete: October 27, 2021

Test Reviewed By: Drew Thornbury, PE
Title: Principal Engineer
Date Reviewed: 10/26/2021

**Standard Test Method for
California Bearing Ratio (CBR) of Laboratory-Compacted Soils**
 ASTM - D1883-16

Project Name:	Southside Fire Station #1	Report Number	E210025.01_CBR
Project Number:	G21051.00	Report Date:	October 27, 2021
Project Location:	Southside, AL	Group / Sample ID:	E21-0025
Sample Description:	(Blend) Tan-Brown, sandy-CLAY	Sample No.:	1
		Depth:	2.0-ft

Soil Classification:	Sample Condition
USCS: Lean Clay with Sand AASHTO: (n/a) LL: 30 < #4: 100% > #4 0.0% PI: 14 < #40: 97% > 3/8" 0.0% NM: (n/a) < #200: 58.00 > 3/4" 0.0%	Soaking: <input checked="" type="checkbox"/> Soaked Duration: 96 hours <input type="checkbox"/> Un-soaked Surcharge <input checked="" type="checkbox"/> 00 - lb Weidghs: <input type="checkbox"/> 05- lb <input type="checkbox"/> 10 - lb
Moisture-Density (before soaking)	CBR Value
Max. UW (pcf): 115.5 <input checked="" type="checkbox"/> D698 Std. <input type="checkbox"/> Method A Opt. M(%): 13.4% <input type="checkbox"/> D1155 Mod. <input type="checkbox"/> Method B Opt. M(%): <input checked="" type="checkbox"/> Method C G_s: 2.55	CBR @ 100% Compaction: 16.5 CBR @ 98% Compaction: 4.0



Remarks: _____

Test Performed By: M. Angwin
Title: Lab Technician
Date Test Began: October 22, 2021
Date Test Complete: October 27, 2021

Test Reviewed By: Drew Thornbury, PE
Title: Principal Engineer
Date Reviewed: 10/26/2021

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual site-wide subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



GEOPROFESSIONAL
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ASSOCIATION

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SECTION 02070 – DEMOLITION AND CLEARING

1.1 SUMMARY

- a. This division includes the demolition of existing asphalt & base, concrete paving, sidewalks, miscellaneous concrete, structures, clearing & grubbing, stockpiling topsoil and inorganic debris as indicated on the plans. Also includes any removal, relocation and abandonment of utilities and any other demolition work within the project area which is necessary to be removed, cleared, demolished or abandoned in order to perform the work as indicated on the drawings and as herein specified.
- b. Extent of Site Clearing is indicated on Drawings and as follows:
 - (1) Protection of existing trees, shrubbery and other vegetation indicated to remain.
 - (2) Removal and/or pruning of trees, shrubbery and other vegetation where indicated or required.
 - (3) Topsoil stripping.
 - (4) Clearing and grubbing.
 - (5) Removing above-grade improvements where indicated.
 - (6) Removing below-grade improvements where indicated.
- c. See Civil, Plumbing and Electrical for removal and/or relocation of existing above-grade or below-grade items relative to those trades.
- d. Contractor shall have all underground utilities located prior to any demolition.

1.2 DEMOLITION AND REMOVAL OF ASPHALT AND BASE

- a. Asphalt surfaces shown to be removed, shall be “saw” cut to a line and then carefully excavated and removed without disturbing the adjacent portions to be retained. Asphalt surfaces and base shall be excavated and removed to a depth necessary for construction as indicated on the plans. Any adjacent asphalt (to remain) that is disturbed/damaged shall be removed and replaced at no additional cost to the owner. All items demolished/removed from this site shall be disposed of off-site at no additional cost to the owner.

1.3 DEMOLITION AND REMOVAL OF CONCRETE PAVING, SIDEWALKS AND MISCELLANEOUS CONCRETE

- a. Concrete paving, sidewalks and miscellaneous concrete shown to be removed, shall be “saw” cut to a line and then carefully excavated and removed without disturbing the adjacent portions to be retained. Any adjacent concrete paving, sidewalks and miscellaneous concrete (to remain) that are disturbed/damaged shall be removed and replaced at no additional cost to the owner. All items demolished/removed from this site shall be disposed of off-site at no additional cost to the owner.

1.4 DEMOLITION AND REMOVAL OF STRUCTURES

- a. Structures shown to be removed shall be carefully demolished and removed including footings and foundations without disturbing any adjacent appurtenances to be retained. Any adjacent appurtenances (to remain) that are disturbed/damaged shall be removed and replaced at no additional cost to the owner. All items demolished/removed from this site shall be disposed of off-site at no additional cost to the owner.

1.5 CUTTING AND REMOVAL OF TREES AND STUMPS, STOCKPILING OF TOPSOIL AND REMOVAL OF INORGANIC DEBRIS

- a. Any trees, stumps and other vegetation shown to be removed, shall be cut and carefully removed to prevent damage to overhead and underground utility lines, adjacent private property, or the work under construction. Any damage to the aforementioned will be the responsibility of the contractor to correct and no additional payment will be made by the owner. See notation on grading plan regarding burning on site of organic debris.
- b. Topsoil as approved shall be stockpiled on-site in a location not to conflict with other phases of this project. Topsoil shall be re-used during the landscaping phase of this project.
- c. Inorganic debris, such as bricks, broken rocks, concrete fragments or other similar materials and trash which interfere with construction shall be removed from the site.

1.6 REMOVAL, RELOCATION AND ABANDONMENT OF UTILITIES

- a. Any overhead and underground utilities shown to be removed, relocated or abandon (in-place) shall be the responsibility of the contractor to perform the necessary work. Contractor shall coordinate with the appropriate utility companies prior to any work. Contractor shall fully cooperate with said utility companies and provide adequate notice/time to allow work to be performed. No additional time will be given to the contractor to perform the work under this contract for delays due to lack of notice to said utility companies or to lack of cooperation with said utility companies during this project.

END OF SECTION 02070

SECTION 02100 – TERMITE CONTROLPART 1 – GENERAL

1.01 GENERAL CONDITIONS

- A. The accompanying General Conditions, Part I, of these specifications shall apply to and form a part of this section.

1.02 SUMMARY

- A. Provide soil treatment for termite control, as herein specified.

1.03 QUALITY ASSURANCE

- A. Applicator: Company specializing in soil treatment for termite control, with five (5) years documented experience.
- B. Materials: Provide certification that toxicants conform to specified requirements.
- C. Material Packaging: Manufacturer's labels and seals identifying contents.

1.04 REGULATORY REQUIREMENTS

- A. Comply with State of Alabama requirements for application, licensing and authority to use toxicant chemicals.

1.05 WARRANTY

- A. **Provide a Five (5) Year Warranty Bonded Guaranty for material and installation.**
- B. Warranty Bonded Guaranty shall cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites; repairs to building or building contents so caused.
- C. Inspect work annually during warranty period and report findings in writing to Owner.
- D. The Owner reserves the right to renew the warranty bonded guaranty for an additional five years.

PART 2 - PRODUCTS2.01 CHEMICALS

- A. The chemical used shall be one of the following, or approved equal, in the concentration designated on the labeled instructions:

Demon TC
Termidor

Aggreszor
Premise

PART 3 - EXECUTION

3.01 APPLICATION

- A. Apply toxicant immediately 12 hours prior to installation of vapor barrier at slabs on grade, or finish grading outside foundation walls, porches and steps.
- B. Apply toxicant in strict accordance with manufacturer's instructions, in rates of coverage as recommended by manufacturer.
- C. Apply extra treatment to structural penetrations, including but not limited to piping, conduit and other soil penetrations.
- D. Apply as a coarse spray to ensure uniform distribution.
- E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work, to avoid disturbance of treated soil. Retreat disturbed treated soil as necessary.

3.01 RETREATMENT

- A. If inspection identifies the presence of termites, retreat soil and retest.
- B. Use same toxicant as used for original treatment.

END OF SECTION 02100

SECTION 02303 – CONCRETE CURB & GUTTER

1:1 SCOPE

This section includes curb and gutter, curbing, valley gutter, and other accessory work necessary to compose a complete paving improvement project in every way.

1:2 CONCRETE MATERIALS

Portland cement shall conform to AASHTO Designation M 85-57, Type 1.

High-Early-Strength Portland cement shall conform to ASTM C 150-49, Type III.

Aggregate for concrete shall conform to the requirements of ASTM C 33-49. Fine aggregates shall be natural sand. Coarse aggregates shall be crushed stone, blast furnace slag, or other approved inert material of similar characteristics or combinations thereof, having hard, strong, durable pieces, free from adherent coatings.

Water shall be clean and free from injurious amounts of oils, acids, alkalies, organic materials, or other deleterious substances.

1:3 FORMS

Forms shall be of wood or metal, straight and free from warp and of sufficient strength when staked to hold the concrete true to line and grade without springing or distorting. Wood forms shall be at least 2" in thickness for straight sections, 1" for radii of curbs, and shall be selected plank surfaced on all sides. Metal forms shall be of approved section and shall have a flat surface on top. Shaping of curb section without the use of forms will not be permitted.

The depth of forms shall be equal to the depth of the curb and gutter. Forms shall be securely fastened at the tops and shall be staked, braced and held together to exact line and grade established. Forms shall be sufficiently tight to prevent the leakage of mortar. Forms shall be cleaned and oiled immediately before concrete is placed.

1:4 SECTIONS

Curb and gutter, valley gutter, and curbing shall be constructed in sections of uniform lengths of 10' unless shown otherwise on the drawings. The length of section may be reduced as necessary to form closures, but no section less than 5' will be permitted.

Curved curb at intersections shall extend around the curve and 1' beyond the point of tangent.

Curb and gutter sections shall be separated by sheet steel template set perpendicular to the face and top of the curbing. Templates shall be 1/8" thick and shall be the full width of the gutter and not less than 2" deeper than the depth of the curb and gutter.

1:5 EXPANSION JOINTS

Expansion joints shall be filled with pre-molded expansion joint filler as specified and shall be placed not more than 50' apart and at points of curve of street returns. Pre-molded expansion joint filler shall be 1/2" in thickness. Pre-molded expansion joint filler shall extend entirely through the expansion joint and shall conform to the cross section of the curb.

1:6 PLACING CONCRETE

Subgrade and forms shall be checked and approved just prior to the placing of concrete.

All debris or other foreign material shall be removed from the space to be occupied by the concrete. The subgrade shall be moist but not wet or muddy.

Concrete shall be placed in the forms and shall be tamped, spaded or vibrated sufficiently to produce a dense homogeneous mass and to bring the mortar to the surface. Particular attention shall be given to spading concrete along and against the surface of the forms to prevent honeycombing and to secure a smooth and uniform surface.

Joint template shall be set during placing of the concrete.

1:7 SUBGRADE

The subgrade shall be constructed or excavated to the required depth below the finished surface as shown on the drawings.

Soft or other unsuitable material shall be removed and replaced with suitable material, and the subgrade shall be compacted to a density of 100% for the top 6" of subgrade.

Fills in subgrade shall be made in layers not to exceed 4" in thickness and finished to a firm, smooth surface.

1:8 FINISHING

After pouring, the concrete shall be struck-off with a template cut to curb edge design. Concrete shall then be finished smooth with a wooden float in a manner to compact the mass and produce a true even top surface.

The surface of the gutter shall be checked with a 10' straight edge and any irregularities more than 1/4" in 10' corrected. Plastering with mortar to build up on finish will not be permitted.

Upper edges of curb and gutter shall be rounded with an approved edging tool.

Forms shall be left in place until the concrete has set sufficiently so they can be removed without damage to the work. Forms shall be left in place not less than 24 hours. Joint templates shall be removed prior to the removal of forms.

Immediately after removal of forms and while concrete is still green, minor defects shall be repaired. Exposed surfaces of the work shall be finished smooth and even by means of a moist wooden float or moist soft rubbing brick. Exposed surfaces shall be finished by a competent workman skilled in finishing concrete.

1:9 PROPORTIONING AND MIXING

Concrete shall be a laboratory design mix. Mix shall be designed for a minimum 28-day compressive strength of 3,000 pounds per square inch when tested in accordance with AASHTO T-22-49 and T-23-49. Mix shall not contain less than 5-1/2 sacks cement per cubic yard of concrete. Fine aggregate shall not be less than 1/3 nor more than 1/2 of total aggregate. Slump shall be not more than 5". Water shall not exceed 7 gallons per sack of

cement, including free water in aggregates. A Certificate from ready mix plant or contractor shall be required, showing compliance with 3,000 PSI requirement.

Concrete shall be ready mixed, transported to job in water-tight agitator or mixer trucks loaded not in excess of rated capacity. Ready-mixed concrete shall be placed within 1-1/2 hours after cement and water have been added to the mix.

1:10 STORAGE OF MATERIALS

Cement and aggregate shall be sorted in such a manner as to prevent deterioration or intrusion of foreign matter. Any material which has deteriorated or has been damaged shall not be used for concrete.

1:11 TESTING AND INSPECTION OF CONCRETE MATERIALS

Tests of concrete and materials shall be made under direction of the Engineer who shall have access to all places where concrete materials are stored, proportioned or mixed.

1:12 CURING AND PROTECTION

After the finishing operation is complete, the concrete shall be covered with burlap or straw and kept continuously moist for a period of not less than 5 days.

Curb and gutter shall be protected from the elements and damage from other causes until the acceptance of the work.

Except by written authorization, concreting shall cease when the descending air temperature in the shade and away from artificial heat falls below 40°F. It shall not be resumed until the ascending air temperature in the shade and away from artificial heat rises to 35°F.

When concrete has been placed in cold weather and the temperature may be expected to drop below 35°F, straw, hay, insulated blankets or other suitable material shall be provided along the line of work. Whenever the air temperature may be expected to reach the freezing point during the day or night, the material shall be spread over the concrete deep enough to prevent freezing of the concrete. Concrete shall be protected from freezing temperatures until it is at least 5 days old. Concrete injured by frost action shall be removed at the contractor's expense.

1:13 BACKFILLING

After the removal of the forms and sufficient setting of the concrete, spaces along front and back of the curb and gutter shall be backfilled to the required elevation with suitable material. Backfill shall be placed in layers of not more than 4" and shall be tamped until firm and solid.

1:14 CLEANING UP

Upon completion of the work, remove all barricades, unused materials, etc., and put the premises in a neat and clean condition.

END OF SECTION 02303

SECTION 03304 -VINYL COATED CHAIN-LINK FENCING and SWING GATES

1:01 SCOPE

This division includes the furnishing and installation of (black) vinyl coated chain-link type fencing on posts and frames with standard ground mounting, double swing gate at locations shown on the plans in accordance with these specifications and the details shown on the plans.

1:02 MATERIALS

Vinyl coated fence shall meet or exceed the applicable specifications for extruded bonded vinyl coated fabric ASTM and/or the Chain Link Fence Manufacturer's Institute Specifications. Fabric shall be attached to terminal posts with (black) vinyl coated 3/16" X 3/4" tension bars and (black) vinyl coated 7/8" X 14 tension bands, spaced at a maximum of 15" intervals. Fastenings to line posts and top rail shall be with 9-gauge aluminum (black) vinyl coated wire at a maximum of 15" intervals. Fence shall be 8-gauge extruded bonded (black) vinyl coated wire (2" mesh).

- a. Line posts: Posts shall be 2" O.D. standard weight pipe, 2.72 lbs./ft., at a maximum of 10-foot spacing, center to center. Posts to be set 30" deep in concrete and plumbed vertically. Material to be fused and bonded (black) vinyl coated.
- b. Corner posts: Posts shall be 2-1/2" O.D. standard weight pipe, 3.65 lbs./ft. Posts to be set 36" deep in concrete and plumbed vertically. Material to be fused and bonded (black) vinyl coated.
- c. Top Rail: Rail to be standard weight pipe, 2.27 lbs./ft. passing through the line post. Tops to form a continuous brace for each stretch of fence. Rails shall be securely fastened to the terminal post. Material to be fused and bonded (black) vinyl coated.
- d. Fittings: All fittings shall be of malleable or heavy pressed steel construction. Material to be fused and bonded (black) vinyl coated.
- e. Swing Gates: Gate shall be 1-5/8" standard pipe industrial double swing gate as shown on the plans. Gate posts shall be 4" O.D. standard weight pipe, 9.11 lbs./ft. Fabric shall be as specified for fence. All hinges, latches, stops and keepers shall be furnished. Material to be fused and bonded (black) vinyl coated.
- f. Privacy Slats: Provide privacy slats at all chain link fencing and gates as follows:
 1. Provide DualOX type slat with locking channels that locks slat in place when installed.
 2. Slat material shall be High Density Polyethylene (HDPE) with UV inhibitors resistant to saltwater, sand, road dirt and most environmental pollutants.
 3. Color shall match vinyl-coated fencing color and shall be selected by the Owner or Architect from the manufacturer's standard colors.

1:03 CONSTRUCTION REQUIREMENTS

- a. General: All construction methods and equipment employed in the setting of the fence shall be in accordance with requirements of the specifications of the manufacturer of the fence materials used and such that the fence will provide the expected service and be durable and complete in every detail.
- b. Setting posts: Posts and anchorages shall be set plumb and true in alignment on the side the fabric is attached and at intervals shown on the plans or as directed by the Engineer. All posts shall be set in concrete at the depth shown on the plans unless otherwise approved by the Engineer. Where fence is over solid rock or other than ground installation is required, special treatment for post or other method of attachment may be authorized. In any event, anchorage must be installed so as to present a neat workmanlike appearance.
- c. Construction of Fence: The chain link fence shall be stretched taut and fastened securely to terminal post with (black) vinyl coated 3/16" X 3/4" tension bars and (black) vinyl coated 7/8" X 14-gauge steel tension bands spaced at a maximum of 15" intervals.

END OF SECTION 03304

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- B. 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.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer manufacturer testing agency.

- B. Welding certificates.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

- c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Regional Materials: Concrete shall be manufactured within 500 miles (800 km) of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- C. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I/II gray.
 - 2. Fly Ash: ASTM C 618, Class F.
- D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- E. Air-Entraining Admixture: ASTM C 260/C 260M.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

- 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- G. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum water-vapor permeance of. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - b. Insulation Solutions, Inc.; Viper VaporCheck 16.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Raven Industries Inc.; Vapor Block 15 10.
 - e. Reef Industries, Inc.; Griffolyn Type-105 Type-65G 15 mil Green.
 - f. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. ChemMasters; SprayFilm.
 - c. Conspec by Dayton Superior; Aquafilm.
 - d. Dayton Superior Corporation; Sure Film (J-74).
 - e. Edoco by Dayton Superior; BurkeFilm.
 - f. Euclid Chemical Company (The), an RPM company; Eucobar.
 - g. Meadows, W. R., Inc.; EVAPRE.
 - h. Metalcrete Industries; Waterhold.
 - i. Nox-Crete Products Group; MONOFILM.
 - j. Sika Corporation; SikaFilm.
 - k. SpecChem, LLC; Spec Film.
 - l. Symons by Dayton Superior; Finishing Aid.
 - m. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - n. Unitex; PRO-FILM.
 - o. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following
 - a. BASF Construction Chemicals - Building Systems; Kure 200.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Conspec by Dayton Superior; W.B. Resin Cure.
 - d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - e. Edoco by Dayton Superior; Res X Cure WB.
 - f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - g. Meadows, W. R., Inc.; 1100-CLEAR.
 - h. Nox-Crete Products Group; Resin Cure E.
 - i. Right Pointe; Clear Water Resin.
 - j. SpecChem, LLC; Spec Rez Clear.
 - k. Symons by Dayton Superior; Resi-Chem Clear.
 - l. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
 - m. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.8 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

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 (ACI 301M).
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 FABRICATING REINFORCEMENT

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

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide

joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

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

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
 - 1. Apply scratch finish to surfaces indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until

surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. 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.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches ((150 mm)) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

- b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1-part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

- D. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Verification of use of required design mixture.
 - 4. Concrete placement, including conveying and depositing.
 - 5. Curing procedures and maintenance of curing temperature.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

- a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

SECTION 03302 - CONCRETE & METAL REINFORCING

1:1 CONCRETE

The concrete shall conform to the following specifications. Walls and other concrete work shall be true to line and grade.

1:2 CEMENT

The cement to be used shall be normal Portland cement and shall conform to the Standard Specifications for Portland Cement for the American Society for Testing Materials (C150-70).

1:3 WATER

Water for concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances.

1:4 FINE AGGREGATE

Fine aggregate shall consist of natural sand; sand prepared from the project obtained by crushing stone or gravel; or, subject to the approval of the Engineer, other inert materials having similar characteristics.

Fine aggregate shall be graded from coarse to fine within the limits shown in the following table:

<u>Sieve Size</u>	<u>Total Passing % by Weight</u>
3/8"	100%
No. 4	95 - 100
No. 16	50 - 85
No. 50	10 - 30
No. 100	2 - 10

1:5 COARSE AGGREGATE

Coarse aggregate shall consist of crushed stone, gravel, air cooled blast furnace slag; or, subject to the approval of the Engineer, other inert materials having similar characteristics, according to the following table:

<u>Sieve Size</u>	<u>Total Passing % by Weight</u>
1-1/2"	100%
1"	95 - 100
1/2"	25 - 60
No. 4	0 - 10

1:6 CONCRETE MIX

All concrete shall be Class A concrete with a 28-day compressive strength of either 3,000 psi or 4,000 psi, as specified; and mixed in the following proportions per cubic yard:

Minimum Mixture for 3,000 psi

451 Lbs.	Type 1 Cement
113 Lbs.	Fly Ash - Type F
1,234 Lbs.	Regular Sand
1,850 Lbs.	#57 Stone
28 Ozs.	Relcrete LR
2.8 Ozs.	Relcrete Air 30
27.6 Gals.	Water

Minimum Mixture for 4,000 psi

500 Lbs.	Type 1 Cement
1,204 Lbs.	Regular Sand
1,900 Lbs.	#57 Stone
31 Ozs.	Relcrete LR
3.1 Ozs.	Relcrete Air 30
110 Lbs.	Fly Ash - Type F
30.6 Gals.	Water

1:7 TESTING

The Engineer will verify strengths by tests made during the process of the work. Should the above proportions fail to produce concrete of required strength and workability, the Engineer shall adjust proportions until desired conditions are attained.

The Contractor shall furnish necessary cylinders for compression tests and cone for slump test. After the Engineer or his authorized representative has made test cylinders, the Contractor shall make arrangements, subject to the approval of the Engineer, for curing cylinders. At the end of 7 and 28 days, the Contractor shall deliver test cylinders to the commercial testing laboratory for tests and the Owner shall bear all expenses in connection with tests.

Tests shall be made at the rate of three cylinders for each 50 cubic yards of concrete poured, or a minimum of one set of three cylinders for each day that concrete is poured, if less than 50 cubic yards.

Cylinders are for 7 and 28-day tests. Break one cylinder at 7 days and the two remaining at 28 days. In special cases, this normal number of control specimens may be exceeded when, in the opinion of the Engineer, such additional tests are necessary. For compression tests, the size of cylinder and the number of molding, capping and testing shall be in accordance with "Method of Making and Curing Concrete Compression and Flexural Specimens in the Field", (ASTN C31).

The maximum quantity of water per 94 lbs. of cement specified shall include the free water in the aggregate; however, moisture absorbed by the aggregates shall not be included. The slump range indicated is intended as a guide to the Contractor for the determination of placing and compacting procedures and equipment. Within the range specified, the slump shall be as directed by the Engineer. If the concrete has a greater slump than the maximum

indicated, the quantity of water shall be reduced to meet the slump requirements. When high frequency mechanical vibration is used for compacting the concrete, the proportions and consistencies shall be modified as required to produce the type of concrete specified. Maximum slump shall be 4".

Material shall be measured by weighing, except as otherwise specified or where other methods are specifically authorized by the Engineer. The apparatus provided for weighing the aggregates and cement shall be suitably designed and constructed for this purpose. Each size of aggregate and the cement shall be weighed separately, the accuracy of all weighing devices shall be such that successive quantities can be measured to within 1% of the desired amount.

Cement in standard packages (sacks) need not be weighed, but bulk cement and fractional packages shall be weighed. The mixing water shall be measured by volume or by weight. The water measuring device shall be susceptible of control accurate to $\pm 1/2\%$ of the capacity of the tank. All measuring devices shall be subject to approval.

Where volumetric measurements are authorized by the Engineer, the weight proportions shall be converted to equivalent volumetric proportions. In such cases, suitable allowance shall be made for variations in the moisture condition of the aggregate, including the bulking effect of the fine aggregate.

1:8 MIXING

The mixing equipment shall be capable of combining the aggregates, cement and water within the specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation.

Unless otherwise authorized by the Engineer, the mixing of concrete shall be done in a batch mixer of approved type which will insure a uniform distribution of the material throughout the mass. The equipment at the mixing plant shall be so constructed that all materials (including the water) which are entering the drum can be accurately proportioned and be under control. The entire batch shall be discharged before recharging. The volume of the mixer material per batch shall not exceed the manufacturer's rated capacity of the mixer. Mixing of each batch shall continue for the periods indicated below during which time the drum shall rotate at a peripheral speed of about 200 feet per minute. The mixing periods shall be measured from time when all of the solid materials are in the mixer drum, provided that all of the mixing water shall be introduced before 1/4 of the mixing time has elapsed.

Mixing time shall be as follows:

1. For mixers of a capacity of one cubic yard, or less: 1 minute
2. For mixers of capacities larger than one cubic yard, the time of mixing shall be increased 15 seconds for each 1/2 cubic yard capacity or fraction thereof.

Truck mixers, unless otherwise authorized by the Engineer, shall be of the revolving drum type; watertight, and so constructed that the concrete can be mixed to insure a uniform distribution of materials throughout the mass. All solid materials for the concrete shall be accurately measured and charged into the drum at the proportioning plant, except, as subsequently provided, the truck mixer shall be equipped with a tank for carrying mixing water.

Only the prescribed amount of water shall be placed in the tank unless the tank is equipped with a device by which the quantity of water added can be readily verified. The mixing water

may be added directly to the batch, in which case a tank will not be required. Truck mixers may be required to be provided with means by which the mixing time can be readily verified by the Engineer. The maximum size of batch in truck mixers shall be in accordance with the specified rating. Truck mixing shall be continued for not less than 50 revolutions after all ingredients, including water, are in the drum. The speed shall not be less than 4 RPM. Mixing shall begin within 30 minutes after the cement has been added to either the water or aggregate. When cement is charged into a mixer drum containing water or surface-wet aggregate and when the temperature is above 90°F., or when high early strength Portland cement is used, this limit shall be reduced to 15 minutes. The limitation on time between the introduction of the cement to the aggregates and the beginning of the mixing may be waived when, in the judgment of the Engineer, the aggregates are sufficiently free from moisture, so that there will be no harmful effects on the cement.

When a truck mixer or an agitator provided with adequate mixing blades is used for transportation, the mixing time at the stationary machine mixer may be reduced to 30 seconds and the mixing completed in a truck mixer or agitator. The mixing time in the truck mixer or agitator equipped with adequate mixing blades shall be as specified for truck mixing.

Concrete transported in a truck mixer, agitator, or other transportation device shall be discharged at the job within 1-1/2 hours after the cement has been added to the water or the aggregate. The maximum volume of mixed concrete transported in an agitator shall be in accordance with the specified ratings.

When hand mixing is authorized, it shall be done on a watertight platform and in such a manner as to insure a uniform distribution of the materials throughout the mass. Mixing shall be continued until a homogeneous mixture of the required consistency is obtained.

The re-tempering of concrete or mortar which has partially hardened will not be permitted.

1:9 CURING

All concrete shall be so protected that the temperature at the surface will not fall below 50°F. Also, all surfaces shall be covered with a white pigmented liquid membrane curing compound complying with ASTM Spec. C309, at the rate specified by the manufacturer or by a 7-day coverage with waterproof paper or polyethylene sheeting (white) complying with ASTM Spec. C171.

1:10 FORMS

Forms shall conform to shape, lines, grades and dimensions of the concrete as called for on the drawings. Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and shall be free from loose knots or other defects. Joints in forms shall be horizontal or vertical where appearance of finished surface is of importance. For unexposed surface and rough work, undressed lumber may be used. Lumber once used in forms shall have nails withdrawn and surfaces to be in contact with concrete thoroughly cleaned before being used again.

Forms shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain the desired position and shape during and after placing concrete. In the case of very long spans where no intermediate supports are possible, the probable deflection in the forms due to the weight of the fresh concrete shall be taken into account so that the finished members shall conform accurately to the desired line and grade. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

Bolts and rods shall preferably be used for internal ties. They shall be so arranged that when the forms are removed, no metal shall be within one inch of any surface.

Unless otherwise specified, suitable moldings or bevels shall be placed in the angles of forms to round or bevel the edge of the concrete.

The inside of forms shall be coated with non-staining mineral oil or other approved material or, in case of wood forms, they shall be thoroughly wetted (except in freezing weather). Where oil is used, it shall be applied before the reinforcement is placed.

Temporary openings shall be provided at the base of column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

The removal of forms shall not be started until the concrete has attained the necessary strength to support its own weight and any construction live loads.

1:11 DEPOSITING CONCRETE

Before beginning placement of concrete, hardened concrete and foreign materials shall be removed from the inner surface of the mixing and conveying equipment.

Before depositing concrete, debris shall be removed from the space to be occupied by the concrete. Forms, if constructed of lumber, shall be thoroughly wetted (except in freezing weather) or oiled. Reinforcement shall be thoroughly secured in position and approval by the Engineer obtained before concrete is placed. Water shall be removed from the space to be occupied by the concrete before concrete is deposited, unless otherwise directed by the Engineer. Any flow of water into an excavation shall be diverted through proper side drains to a sump, or be removed by other approved methods which will avoid washing the freshly deposited concrete. If directed by the Engineer, water vent pipes and drains shall be filled by grouting or otherwise after the concrete has thoroughly hardened.

Concrete shall be handled from the mixer or, in the case of ready-mixed concrete, from the transporting vehicle to the place of final deposit as rapidly as practicable by methods which shall prevent the separation or loss of ingredients. Under no circumstances shall concrete that has partially hardened be deposited in the work. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. Forms for walls or thin sections of considerable height shall be provided with openings or other devices that permit the concrete to be placed in a manner that will prevent separation and accumulation of hardened concrete on the forms or metal reinforcement above the level of the concrete. Concrete, regardless of the type of transportation vehicle, shall have the quality required when deposited in the forms.

When concrete is conveyed in chutes, the equipment shall be of such size and design as to measure a continuous flow in the chute. The chutes shall be of metal or metal-lined and the different portions shall have approximately the same slope. The slope shall not be more than one vertical to two horizontal and not less than one vertical to three horizontal, and shall be such as to prevent the segregation of the ingredients.

The discharge end of the chute above the surface of the concrete shall be more than 3 times the thickness of the layer being deposited, but not more than five feet above the surface of the concrete. A spout shall be used and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a

hopper. The chute shall be thoroughly cleaned before and after each run and the debris and any water used shall be discharged outside the forms. Where concrete is conveyed and placed by pneumatic means, the equipment shall be suitable in kind and adequate in capacity for the work. The machine shall be located as close as practicable to the place of deposit. The position of the discharge and of line shall not be more than 10' from the point of deposit. The discharge lines shall be horizontal or inclined upwards from the machine. At the end of placement, the entire equipment shall be thoroughly cleaned.

Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall be suitable in kind and adequate in capacity for the work. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients. After this operation, the entire equipment shall be thoroughly cleaned.

Concrete, during and immediately after depositing, shall be thoroughly compacted by means of suitable tools. For thin walls or inaccessible portions of the forms where spading, rodding, or forking is impractical, the concrete shall be worked into place by vibration or hammering the forms lightly opposite the freshly deposited concrete. The concrete shall be thoroughly worked around the reinforcement and around embedded fixtures and into the corners of the forms.

Accumulations of water on the surface of the concrete due to water gain, segregation, or other causes during placement and compacting, shall be prevented as far as possible by adjustments in the mixture. Provisions shall be made for the removal of such water as may accumulate so that under no circumstances will concrete be placed in such accumulations.

Concrete may be compacted by mechanical vibration. When mechanical vibration is used, the number and type of vibrators shall be subject to the approval of the Engineer.

Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer. Such joints shall be made in accordance with the provisions.

Concrete, when deposited, shall have a temperature of not less than 50°F., nor more than 95°F. In freezing weather, suitable means shall be provided for maintaining the concrete at the temperature and for the periods specified or until the concrete has thoroughly hardened. Before placing the concrete, the forms shall be free from frost and ice, and after the concrete is placed, it shall be protected on all exposed sides by straw, tarpaulins or other means.

The method of heating the materials and protecting the concrete shall be approved by the Engineer. Salts, chemicals, or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.

Before depositing new concrete on or against concrete which has hardened, the forms shall be re-tightened. The surface of the hardened concrete shall be roughened as required by the Engineer, in a manner that will not leave loosened particles of aggregate or damaged concrete at the surface. It shall be thoroughly cleaned of all foreign matter and laitance and saturated with water. To insure an excess of mortar at the junction of the hardened and the newly deposited concrete, the cleaned and saturated surfaces shall first be thoroughly covered with a coating of mortar or neat cement grout against which the new concrete shall be placed before the grout has attained its initial set.

1:12 CONCRETE FINISH

The surface finish of all concrete one foot below grade shall be given the following finish:

Immediately following the removal of forms, all fins and irregular projections shall be removed, cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges and other defects shall be thoroughly cleaned; and after having been kept saturated with water for a period of not less than three hours, shall be carefully pointed and trued with mortar of cement and fine aggregate mixed in the proportions used in the concrete being finished. Mortar used in pointing shall not be more than one hour old. The mortar patches shall be cured as specified under "Curing". All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

The surface finish of all exposed concrete and one foot below finished grade shall have a rubbed finish as follows:

After removal of forms, the rubbing of concrete shall be started as soon as its condition will permit. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water for a minimum period of 3 hours. Sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing of rod holes and defects to thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished. Rubbing shall be continued until all forms marks, projections and irregularities have been removed, all voids filled and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place at this time.

After all concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform in color.

After final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and shall be left free from all unsound patches, paste, powder and objectionable marks.

1:13 METAL REINFORCING

Metal reinforcing shall be plain or deformed steel bars or cold drawn steel wire or fabricated forms of these materials, as required by the drawings or the specifications, or both. These materials shall conform in quality to Standard Specifications of The American Society for Testing Materials of the applicable titles and serial designations following:

Bars: Billet-Steel Bars for Concrete Reinforcement (A615).

Wire: Cold-drawn Steel Wire for Concrete Reinforcement (A82).

Fabricated Materials: Fabricated Steel Bar or Rod Mats for Concrete Reinforcement (A184). Welded Steel Wire Fabric for Concrete Reinforcement (A185).

1:14 PLACEMENT OF METAL REINFORCEMENT

A. General: The material, placement, bending and workmanship for all metal reinforcement shall be in accordance with the current edition of the following standards unless modified on the drawings or elsewhere in these specifications:

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures

ACI 301 Specifications for Structural Concrete for Building

CRSI Recommended Practice for Placing Reinforcing Bars

B. Placement: Provide a minimum cover of 3" for reinforcing steel when the concrete is placed directly against the ground.

Provide a minimum cover of 2" for bars larger than #5, and 1-1/2" for #5 bars or smaller if, after removal of forms, the concrete is exposed to the weather or contact with ground.

Provide a minimum cover of 3/4" for reinforcing in slabs and walls, and 1-1/2" for beams not exposed directly to weather or ground.

Provide a minimum lap for all splices of 40 bar diameters, but not less than 12" unless noted.

1:15 WATER BEARING WALLS

All water bearing walls shall be poured as shown on plans. All construction joints shall have keyways and 6" PVC water stop. All pipe penetrations through such walls shall be with wall sleeves poured as an integral part of the wall.

1:16 METAL REINFORCEMENT SHOP DRAWINGS

Shop drawings shall be submitted by the Contractor to the Engineer for approval on all reinforcement steel showing layout and bending of reinforcement. Three copies of shop drawings shall be submitted and drawings approved before fabrication.

1:17 OVER-EXCAVATION

All slabs and footings shall be excavated to line and grade as shown on drawings. Any over-excavation shall be brought to grade with concrete (or material approved by Engineer). This shall be performed by the Contractor and at his expense.

1:18 CONCRETE PAVEMENT AND DITCH SECTIONS

Concrete shall be properly placed on the prepared subgrade, adequately consolidated, and struck off to the grades shown on the plans. Concrete shall be placed continuously to prevent the formation of "cold joints". Wherever placing operations stop (for a period of 30 minutes or more), a bulkhead shall be installed to form a straight joint.

The sequence of finishing operations shall be the strike-off and consolidation, joint forming and floating (if necessary), straight edging, and texturing (if required).

The pavement surface shall be graded to ensure that water will run off and shall be free of depressions in which water will stand. Any excess water and laitance shall be removed from the surface of the pavement.

The finished surface shall be checked for smoothness with a 10' straight edge; irregularities shall be corrected by adding or removing concrete (all disturbed areas shall again be straightedge).

A uniformly gritty final texture shall be provided (where required) by brushing the surface with a stiff-bristled broom, or by dragging a "burlap drag" over the surface just before the water sheen disappears.

1:19 JOINTS

The pavement shall be jointed to control cracking. All construction joints, isolation joints, and control joints shall be placed as indicated on the plans, or a joint layout, compatible with the Contractor's paving method and equipment, must be submitted to the Engineer for approval prior to construction.

Longitudinal and transverse joint spacings shall be at regular intervals as shown on the plans. Individual spacings may vary slightly to meet catch basin and manhole castings.

Control joints shall be made by sawing, tooling, or installing an approved insert to a depth 1/4 the slab thickness. Sawing of joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without appreciable raveling (usually 4 to 24 hours). All joints shall be sawed before uncontrolled shrinkage cracking occurs.

Joints shall be continuous across the slab unless interrupted by a full depth joint and must extend completely through the curb. Form offsets used at radius points to provide continuity in paving operations should be at least one foot; preferably two feet.

Isolation (expansion) joints must be full depth and shall only be installed to isolate fixed objects within or abutting the paved area (structures, castings, and sidewalks).

In general, all joints shall require sealing.

1:20 JOINT SEALANT

All joints shall be sealed using a two-component, polysulfide, waterproof sealant containing elastomeric components based on synthetic rubber (Thiokol). The sealant shall be "Thorospan S" or equal.

Sealant shall be applied to a clean, dry surface free of oils, grease, putty, form release agents, asphalts, wax coatings, paint or any loose aggregates in accordance with manufacturer's recommendations. Concrete shall be completely cured prior to sealing.

END OF SECTION 03302

SECTION 04720 - ARCHITECTURAL CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.
- B. This Section Includes all labor, materials and equipment to provide the Architectural Cast Stone shown on Drawings and as described in this section, and the following:
 - 1. Cast Stone Caps, formed to shapes and dimensions as indicated on Drawings at the following locations:
 - (a) Cast stone caps at Patio Bench Masonry Walls and at Masonry Column Bases at Arcade.
- C. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal the Cast Stone as required.

1.2 RELATED SECTIONS

- A. Part 1, Section 01300 "Submittals."
- B. Division 4, Section 04810 "Unit Masonry" for installing cast stone units on unit masonry.
- C. Division 7 Section 07920 "Joint Sealants" for sealing joints in cast stone.

1.3 REFERENCES

- A. Cast Stone Institute® Technical Manual (Current Edition)

1.4 DEFINITIONS

- A. Cast Stone: A refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.
 - 1. Dry Cast Concrete Products – manufactured from zero slump concrete.
 - (a) Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero- slump concrete against a rigid mold until it is densely compacted.
 - (b) Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
 - 2. Wet Cast Concrete Products – manufactured from measurable slump concrete.
 - (a) Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5 SUBMITTAL PROCEDURES

- A. Comply with Section 01300 "Submittals."
- B. Product Data: For each type of product indicated.
 - 1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages, and indication of finished faces.
 - 1. Include elevations and sections showing layout of units and locations of joints and anchors.
 - 2. Indicate pertinent dimensioning, layout, anchorages, construction details, method of installation and adjacent construction.
 - 3. Submit installation instructions and field erection drawings.
- D. Anchorage Design: Cast Stone manufacturer is responsible for designing anchorage for each cast stone installation as indicated on Drawings. Submit complete design drawings and calculations which verify that the proposed special cast stone shapes and units, and their anchorage system meet the specified structural requirements. If necessary, engage a qualified professional engineer to prepare design calculations, shop drawings and other structural data. These submittals shall be stamped and signed by the designing structural engineer,
- E. Samples for Initial Selection: For colored mortar.
- F. Samples for Verification:
 - 1. For color and texture of cast stone required, 10 inches square in size.
 - 2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.
 - 3. Each type of anchorage device proposed for the work.
- G. Full-Size Samples: For each color, texture and shape of cast stone unit required.
 - 1. Make available for Architect's review at Project site.
 - 2. Approved Samples may be installed in the Work.
- H. Qualification Data: For manufacturer and testing agency.
 - 1. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing. Provide test reports based on testing within previous two years.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. A qualified manufacturer of cast stone units similar to those indicated for this Project, who has sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule. Manufacturer shall have a minimum of ten (10) years experience in producing cast stone.
 - 2. Obtain cast stone units through single source from single manufacturer.
- B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

PART 2 – PRODUCTS

- 2.1 AVAILABLE MANUFACTURERS: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

- A. Bassco Caststone, Elkmont, AL
- B. Melton Classics Incorporated, Lawrenceville, GA
- C. Corbelstone, Inc., Flowery Branch, GA

2.2 ARCHITECTURAL CAST STONE

- A. Comply with ASTM C 1364
 - 1. Physical properties: Provide the following:
 - 2. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.
 - 3. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
 - 4. Air Content – ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
 - 5. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
 - 6. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.

2.3 RAW MATERIALS

- A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
 - 1. ASTM C 260 for air-entraining admixtures.
 - 2. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
 - 3. Other admixtures: integral water repellents and other chemicals, for which no STM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 - 4. STM C 618 mineral admixtures of dark and variable colors shall not be used n surfaces intended to be exposed to view.
 - 5. STM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
- F. Water – Potable

2.4 COLOR AND FINISH

- A. Match color and finish of approved sample. Cast Stone Sample approved during shop drawing submittal and review will be maintained at the site, to judge conformance of actual stone installed at site with approved sample.
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar voids shall be less than 3 occurrences per any 1 in.2 (25 mm2) and not obvious under direct daylight illumination at a 5 ft (1.5m) distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3 m) distance.
 - 1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - a. Total color difference – not greater than 6 units.
 - b. Total hue difference – not greater than 2 units.
- D. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6 m) distance.
- E. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.5 ANCHORS, REINFORCING AND MISCELLANEOUS

- A. Reinforce the units as required for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross section area.
- C. Anchors: Type and size as required, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A666.
- D. Dowels: ½ inch diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A666.
- E. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- F. Panels, soffits and similar stones greater than 24 in. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.
- G. Welded wire fabric reinforcing shall not be used in dry cast products.
- H. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.
- I. Water Repellant: Silane or siloxane sealer, as recommended by cast stone manufacturer.

2.6 CURING

- A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days at 50°F/10°C or 5 days at 70°F (21°C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.7 MANUFACTURING TOLERANCES

- A. Cross section dimensions shall not deviate by more than 1/8 in. (3 mm) from approved dimensions.

- B. Length of units shall not deviate by more than length/ 360 or 1/8 in. (3 mm), whichever is greater, not to exceed 1/4 in. (6 mm).
 - 1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp, bow or twist of units shall not exceed length/ 360 or 1/8 in. (3 mm), whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in. (9 mm) maximum deviation.

2.8 MORTAR MIXES

- A. Comply with requirements in Division 4 Section "Unit Masonry" for mortar mixes.
- B. 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.
- C. Comply with ASTM C 270, Proportion Specification.
 - 1. For setting mortar, use Type S.
 - 2. For pointing mortar, use Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored aggregate mortar for exposed mortar joints.

2.9 CAST STONE UNIT SHAPES

- A. All cast stone units shall be custom-fabricated to shapes and dimensions as shown on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING TOLERANCES

- A. Comply with Cast Stone Institute® Technical Manual.
- B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.
- C. Joints, plus - 1/16 in. (1.5 mm), minus - 1/8 in. (3 mm).

3.3 JOINTING

- A. Joint size:
 - 1. At stone/brick joints 3/8 in. (9.5 mm).
 - 2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
 - 3. Stone/stone joints exposed on top 3/8 in. (9.5 mm).
- B. Joint materials:
 - 1. Mortar, Type N, ASTM C 270.
 - 2. Use a full bed of mortar at all bed joints.
 - 3. Flush vertical joints full with mortar.
 - 4. Leave all joints with exposed tops or under relieving angles open for sealant.
- C. Location of joints:
 - 1. As shown on approved shop drawings. See Architectural Drawings for suggested joint locations.

3.4 SETTING

- A. Drench units with clean water prior to setting.
- B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- C. Set units in full bed of Type S mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile.

3.5 JOINT PROTECTION

- A. Comply with requirements of Division 7 Section 07920 "Joint Sealants".
- B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 REPAIR AND CLEANING

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners.

3.7 INSPECTION AND ACCEPTANCE

- A. Inspect finished installation according to Bulletin #36.

- B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

3.8 WATER REPELLANT

- A. Apply silane or siloxane water repellant for weatherproofing cast stone in accordance with manufacturer's instructions.
- B. Apply water repellant after pointing, repair, cleaning, inspection, and acceptance are completed.

END OF SECTION 04720

SECTION 04810 - UNIT MASONRYPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of masonry work is indicated on drawings and schedule.
- B. Types of masonry work required include:
- (1) Reinforced unit masonry
 - (2) Concrete unit masonry
 - (3) Brick masonry
 - (4) Wall control joints (w.c.j.)
 - (5) Unit masonry reinforcement, anchors and accessories
 - (6) Mortar and grout for unit masonry
 - (7) Cavity-Wall Insulation.
- C. Foamed-In-Place Masonry Wall Insulation is specified in a Division 7 Section.
- D. Flashings and Joint Sealers related to Unit Masonry are specified in Division 7 Sections.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, (Per 2016 International Building Code), or by another means, as acceptable to authorities having jurisdiction.
- D. Field Constructed Mock-ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with the following requirements:
- (1) Locate mock-ups on site in locations as directed by Architect.

- (2) Building mock-ups for the following types of masonry in sizes of approximately 4' long by 2' high by full thickness.
 - (a) Typical exterior face brick with areas depicting typical concrete block back-up.
 - (b) Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.
- (3) Preconstruction Tests by Unit Test Methods: Test the following materials by methods indicated:
 - (a) Brick: Test each type and grade of brick per ASTM C 67. If coefficient of variation of compression samples tested exceeds 12%, obtain compressive strengths by multiplying average compressive strengths by $(1-1.5) \times (0.01 \times \text{coefficient of variation}) - (0.12)$.
 - (b) Concrete Masonry Units: Test each type, class and grade of concrete masonry unit per ASTM C 140.
 - (c) Mortar Tests: Test each mortar type per ASTM C 780.

1.04 SUBMITTALS

- A. Products data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with all specified requirements, including fire performance requirements.
- B. Samples for initial selection purposes: Submit samples of the following materials:
 - (1) Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
 - (1) Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.
- C. Store cementitious materials off the ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained.
- E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.06 PROJECT CONDITIONS

- A. Protection of work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

- B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
- D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.
- E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- G. Protect sills, ledges and projections from droppings of mortar.
- H. Cold weather protection:
 - (1) Do not lay masonry units which are wet or frozen.
 - (2) Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
 - (3) Remove masonry damaged by freezing conditions.
- I. For clay masonry units with initial rates of absorption (suction) which require them to be settled before laying, comply with the following requirements.
 - (1) For units with surface temperatures above 32 degrees F (0 degrees C), wet with water heated to above 70 degrees F (21 degrees C).
 - (2) For units with surface temperatures below 32 degrees F (0 degrees C), wet with water heated to above 130 degrees F (54 degrees C).
- J. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperatures selected with 10 degrees F (6 degrees C).
 - (1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Mortar: Heat mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
Grout: Follow normal masonry procedures.
 - (2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperatures of 70 degrees F (21 degrees C) at end of work day.
 - (3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Mortar: Heating mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Heat both sides of walls under construction using salamanders or other heat sources.
Use windbreaks or enclosures when wind is in excess of 15 mph.

- (4) 20 degrees F (-7 degrees C) and below:
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Masonry Units: Heat masonry units so that they are above 20 degrees F (-7 degrees C) at time of laying.
Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F (4 degrees C) for 24 hours after laying units.
 - (5) Do not heat water for mortar and grout to above 160 degrees F (71 degrees C).
- K. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.
- (1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 - (2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Completely cover masonry with weather-resistive membrane for at least 24 hours.
 - (3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours grouted masonry.
 - (4) 20 degrees F (-7 degrees C) and below:
Except as otherwise indicated, maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 degrees F (4 degrees C) for 48 hours.

PART 2 - PRODUCTS

2.01 BRICK MADE FROM CLAY OR SHALE

- A. Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
- (1) Size: Provide bricks manufactured to the following actual dimensions:
 - (a) Standard Modular: 3-5/8" thick x 2-1/4" high x 7-5/8" long.
 - (2) For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view provide un-cored or un-frogged units with all exposed surfaces finished.
- B. Face Brick: ASTM C216, and as follows:
- (1) Grade SW.
 - (2) Type FBS.
 - (3) Application: Use where brick is exposed, unless otherwise indicated.
 - (4) Texture and Color: Provide face brick of colors and textures as follows:

- C. For purpose of determining minimum performance and quality standards, face brick specification is based upon products as supplied by ACME Brick Company.
- (1) Equal products of other brick suppliers will be considered, subject to submission in accordance with Part 1 Section "Prior Approval".
 - (2) **Main Face Brick**: Face Brick (where denoted on the Drawings as "Face Brick") will be selected by the Architect using an allowance of **\$550.00 per thousand**.
 - (3) **Accent Soldier Course Brick**: Accent Brick (where denoted on Drawings as "Soldier Course Accent Brick.") shall be selected by the Architect using an allowance of **\$550.00 per thousand**.
- C. Building (Common) Brick: ASTM C 62, and as follows:
- (1) Grade SW.
 - (2) Application: Use where brick is indicated for concealed locations.

2.02 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
- (1) Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 - (2) Provide bull nose units for outside corners, except where specifically indicated on Drawings as square-edged units.
- B. **Concrete block**: Provide units complying with characteristics indicated below for grade, type, face size, exposed face and, under each form of block included, for weight classification.
- (1) Grade N except Grade S may be used above grade in exterior walls with weather protective coatings and in walls not exposed to weather.
 - (2) Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
 - (3) Type I, moisture-controlled units.
 - (a) Cure units by autoclave treatment at a minimum of 350 degrees F (176 degrees C) and a minimum pressure of 125 psi.
 - (4) Exposed faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - (5) Hollow Load bearing Block: ASTM C90 and as follows:
 - (a) Weight Classification: Lightweight.
 - (b) Fire rated units where indicated.
- C. Concrete Building Brick: Provide units complying with ASTM C55 and characteristics indicated below for grade, type, size and weight classification.
- (1) Grade: Same as indicated for concrete block.
 - (2) Type: Same as indicated for concrete block.

- (3) Size: Standard Modular 2" x 3-5/8" x 7-5/8"
- (4) Weight Classification: Lightweight

2.03 MORTAR AND GROUT MATERIALS

- A. Portland cement: ASTM C150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.
 - (1) Mortar mix type and color shall be selected by the Architect using an allowance of **\$15.00 per bag** for all exposed face brick and accent brick applications.
- B. Hydrated lime: ASTM C207, Type S.
- C. Aggregate for mortar: ASTM C144, except for joints less than 3/8" use aggregate graded with 100% passing the No. 16 sieve.
 - (1) White Mortar Aggregates: Natural white sand or ground white stone.
- D. Aggregate for grout: ASTM C404.
- E. Water: Clean and potable.

2.04 ADJUSTABLE MASONRY VENEER ANCHORS

- A. GENERAL: Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to fit; for attachment over sheathing to metal studs; and with the following structural performance characteristics:
 - (1) Structural Performance Characteristics: Capable of withstanding a 100 lb load in either tension or compression without deforming over, or developing play in excess of 0.05 inch.
- B. SCREW-ATTACHED MASONRY VENEER ANCHORS:
 - (1) Wire Tie Shape: Triangular; 3/16" diameter; hot-dipped galvanized.
 - (2) Wire Tie Length: As required to extend 1-1/2 inches minimum into masonry wythe of veneer face.
 - (3) Anchor Section: 14 gauge hot-dipped galvanized sheet metal plate, with screw holes top and bottom and with raised, rib-stiffened strap stamped into center to provide slot between strap and plate for connection of wire tie; of overall size indicated below.
 - (a) Size: Plate and strap size: 1-1/4 inches wide for plate, 5/8 inch for strap by lengths indicated below; slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32 inch plus diameter of wire tie.
 - (b) Plate and Strap Lengths: 6 inches and 3-5/8 inches; with both sides of plate stiffened by ribs.
 - (c) Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene washer, #10 diameter by lengths required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating.
 - (1) Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B117.

- (2) Screws for attachment of anchors to aluminum canopy columns shall be STAINLESS STEEL.
- (d) Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
 - (1) Screw-attached Masonry Veneer Anchors; Heckmann Building Products; Hohmann & Barnard, Inc.; Wire-Bond.
- (e) Locations:
 - (1) At brick veneer over steel stud back-up framing with sheathing;
 - (2) At brick veneer or concrete unit masonry over cast-in-place concrete walls;
 - (3) See Drawings for extent.

2.05 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
 - (1) Zinc-coated (galvanized) steel wire: ASTM A82 for uncoated wire and with ASTM A641 for zinc coating of class indicated below:
 - (a) Class 3 (0.80 oz. per sq. ft. of wire surface).
 - (b) Application: Use where indicated.
- B. Joint reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
 - (1) Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 2" elsewhere.
 - (2) For single-wythe and multi-wythe masonry provide type as follows with single pair of side rods:
 - (a) Truss design with continuous diagonal cross rods spaced not more than 16" o.c.
 - (3) For multi-wythe masonry with brick veneer or split-face concrete masonry veneer, provide type as follows:
 - (a) Ladder design with perpendicular cross spaced not more than 16" o.c. and number of side rods as follows: Three (3)
 - (b) Exterior Walls with Face Brick Veneer or Smooth-Face Concrete Masonry Veneer over Concrete Block: Equal to DUR-O-WAL "D/A 360" LADUR-EYE.
- C. Anchor bolts: Where wood blocking and other items are bolted to unit masonry, provide steel bolts with hex nuts and flat washers complying with ASTM A307, Grade A, hot-dip galvanized to comply with ASTM C153, Class C, in sizes and configurations indicated on drawings.
- D. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

AA Wire Products Co.
 Dur-O-Wall, Inc.
 Heckman Building Products, Inc.

Hohmann & Barnard, Inc.
Masonry Reinforcing Corp. of America
National Wire Products Corp.

2.06 CONCEALED FLASHING MATERIALS

- A. Sheet metal flashing: Sheet metal flashing is specified in Division 7, "Flashing and Sheet Metal".
- B. Membrane flashing: Membrane flashing is specified and furnished under Division 7, "Membrane Flashing". Installation of membrane flashing is specified in this section.

2.07 MASONRY CLEANERS

- A. Acidic cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting of systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.
 - (1) Available products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to the following:
 - (a) "Sure Klean" No. 600 detergent; ProSoCo, Inc.
 - (b) Use products only as recommended by block manufacturer for cleaning colored concrete masonry units.

2.08 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
 - (1) Do not use calcium chloride in mortar or grout.
- B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for unit masonry: Comply with ASTM C270, proportion specification, for types of mortar required, unless otherwise indicated.
 - (1) Limit cementitious materials in mortar to portland cement-lime.
 - (2) Use Type M mortar for masonry below grade and in contact with earth and where indicated.
 - (3) Use Type S mortar for reinforced masonry and where indicated.
- D. Grout for unit masonry: Comply with ASTM C476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
 - (1) Use fine grout in grout spaces less than 2" in horizontal direction unless otherwise indicated.
 - (2) Use coarse grout in grout spaces 2" or more in least horizontal dimension unless otherwise indicated.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

- A. Reinforcing Bars: Deformed steel, ASTM A615, Grade 60 for bars No. 3 to No. 18.
- B. Pre-molded control joint strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated on Drawings. Indicated as "W.C.J." on drawings.
 - (1) Polyvinyl chloride complying with ASTM D2287, General Purpose Grade, Type PVC 654-4.
- C. Anchors for connecting masonry to structural steel framework:
 - (1) General: Assemblies as detailed and/or noted on Structural Drawings.
 - (2) Products of Heckmann Building Products, Inc., or equal.
 - (3) Coordinate required anchor types with spray-on fireproofing system (if applicable).
- D. Weep Holes: 5/16" sash-type cotton weep cords (well greased) for use at all weep holes

2.10 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation with Increased R-Value: ASTM C 578, Type IV, but with an aged thermal resistance (R-value) for 1.5 inch thickness of 5.6 deg F x h x sq. ft./Btu at 75 deg F at 5 years; closed-cell product with a carbon-black filler and extruded with an integral skin.
- B. Molded-Polystyrene Board Insulation: ASTM C 578, Type I.
- C. Adhesive: Type recommended by insulation board manufacturer for application indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Using wetting methods which ensure each clay masonry unit being nearly saturated by dry when laid.
- B. Do not wet concrete masonry units.
- C. Cleaning reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.
- D. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.
- E. Build chases and recesses as shown or required for the work of other trades.
- F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

- G. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full size units without cutting where possible.

(1) Use dry cutting saws to cut concrete masonry units.

3.02 CONSTRUCTION TOLERANCES

- A. Variation from plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 3/8" maximum.
- B. Variation from level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1-16" within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 2" in any bay or 20' maximum, nor 3/4" in 40' or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 2".
- E. Variation in mortar joint thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8" with a maximum thickness limited to 2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.03 LAYING MASONRY WALLS

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
- C. Concrete Unit Masonry Pattern Bond: Lay all exterior and interior exposed concrete unit masonry in **RUNNING BOND PATTERN**. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- D. Face Brick Pattern Bond: Unless specifically shown or noted otherwise on Drawings, lay exposed face brick in **RUNNING BOND PATTERN**, with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

- E. Stopping and Resuming Work: Rack back 2 of unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.
- F. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
 - (1) Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - (2) Where the hollow metal frame and masonry work make contact, the joint shall be raked clear of mortar and sealed under Division 7 Section "Joint Sealants".
 - (3) All cells of the masonry units for the extent of door anchors shall be filled solid with mortar the height of jambs.
 - (4) Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
 - (5) Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.04 MORTAR BEDDING AND JOINTING

- A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
- D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
- E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.05 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

- A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
 - (1) For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
- (1) Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
- D. Non-bearing Interior Partitions: Build to a height indicated on Drawings, except where indicated to be built tight to underside of roof deck above.
- (1) Wedge non-bearing partitions against structure above with small pieces of tile, slate or metal. Fill joint with mortar after dead load deflection of structure above approaches final position.
 - (2) At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Safing."

3.06 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes or tab-type reinforcement.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.
- C. Tie exterior wythe to back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16" o.c. vertically.
- D. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Damp-proofing."
- E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry, cast-in-place concrete or other construction as shown.
1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry or concrete substrate.
- F. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2'-0" o.c. unless otherwise indicated.

3.07 HORIZONTAL JOINT REINFORCEMENT

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 2" elsewhere. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- E. Space continuous horizontal reinforcement as follows:
 - (1) For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code, but not more than 16" o.c. vertically.
 - (2) For single-wythe walls, space reinforcement at 16" o.c. vertically unless otherwise indicated.
- F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.
 - (1) In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural steel members to comply with the following:
 - (1) Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - (2) Anchor masonry to structural members with flexible 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.

3.09 ANCHORING SINGLE-WYTHER MASONRY VENEER TO METAL STUDS

- A. Anchor single-wythe masonry veneer to sheathed metal studs, cast-in-place concrete or fully grouted masonry, with masonry veneer anchors to comply with the following requirements:
 - (1) Fasten each anchor section through sheathing to metal studs, concrete or masonry with 2 metal fasteners of type indicated.
 - (2) Embed tie section in masonry joints. Provide not less than 1-1/2" air space between back of masonry veneer wythe and face of sheathing.

- (3) Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
- (4) Space anchors as indicated but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 8 inches.

3.10 INSTALLATION OF REINFORCED UNIT MASONRY

- A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard and Structural Drawings and Specifications.
- B. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction.
 - (1) Construct formwork to conform to shape, line, and dimensions shown. Make 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.
- C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
- D. 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.

3.11 CONTROL AND EXPANSION JOINT

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in as the masonry work progresses.
- B. Build-in non-metallic joint fillers at locations indicated on Drawings.

3.12 LINTELS

- A. Install steel lintels where indicated. See Architectural and Structural Drawings.
- B. Provide masonry lintels where shown and wherever openings of more than 1'0" for brick size units and 2'0" for block size units are shown without structural steel or other supporting lintels. Provide pre-cast or formed-in-place masonry lintels. Cure pre-cast lintels before handling and installation. Temporarily support formed-in-place lintels.
 - (1) For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout. See Architectural and Structural drawings.
- C. Provide minimum bearing of 8" at each jamb unless otherwise indicated.

3.13 FLASHING OF MASONRY WORK

- A. General: Provide concealed flashing in masonry work at or above shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover

with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

- B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4" and through the inner wythe to within 5/8" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.
- C. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry or concrete.
- D. Provide specified weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

3.14 REPAIR, POINTING AND CLEANING

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Pointing up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
 - (1) Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
 - (2) Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
 - (3) Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - (4) Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - (a) Acidic Cleaner; apply in compliance with directions of cleaner manufacturer.
 - (5) Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.
- D. Protection: Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

SECTION 04850 - MEMBRANE FLASHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Membrane flashing shall be installed at locations as shown on drawings.

1.03 RELATED SECTIONS

- A. Division 4, Section 04810 "Unit Masonry"

1.03 SUBMITTALS

- A. Furnish sample and manufacturer's data for Architect's approval.

PART 2 - PRODUCTS

2.01 MATERIALS – GENERAL

- A. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
 - a. Available Products:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
 - 4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 6) Hohmann & Barnard, Inc.; Textroflash.
 - 7) Polyguard Products, Inc.; Polyguard 300.
 - 8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
 - 9) Williams Products, Inc.; Everlastic MF-40.
 - 2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymers alloy as follows:
 - a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
 - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch-thick coating of rubberized-asphalt adhesive.

- c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
 - 1) Color: Black.
- d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 - 1) Hyload, Inc.; Hyload Cloaked Flashing System, or approved equal.
- 3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
 - a. Available Products:
 - 1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
 - 2) Firestone Building Products; FlashGuard.
 - 3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
 - B. Adhesives, Primers and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All surfaces to receive the flashing shall be reasonably smooth and free from irregularities. On all horizontal surfaces, the flashing shall be laid above a trowel coat of mastic. Vertical surfaces shall be spot tacked, to hold flashing in place.
- B. Installation shall be done under Division 4 Unit Masonry Section.

END OF SECTION 04850

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This Section includes the following:

1. Exterior non-load-bearing wall framing and furring systems.

Related Sections:

1. Division 6 Section 06160 "Sheathing".
2. Division 7 Section 07210 "Insulation"

1.3 PERFORMANCE REQUIREMENTS

Structural Performance: Provide cold-formed metal framing and furring capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.

Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

5. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
6. Design exterior non-load-bearing wall framing and furring to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

Product Data: For each type of cold-formed metal framing and furring product and accessory indicated.

Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing and furring; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

Welding certificates.

Qualification Data: For professional engineer and testing agency.

Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

2. Steel sheet.
3. Expansion anchors.
4. Power-actuated anchors.
5. Mechanical fasteners.
6. Vertical deflection clips.
7. Horizontal drift deflection clips
8. Miscellaneous structural clips and accessories.

Research/Evaluation Reports: For cold-formed metal framing and furring.

1.5 QUALITY ASSURANCE

Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

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.

Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

Protect cold-formed metal framing and furring from corrosion, deformation, and other damage during delivery, storage, and handling.

Store cold-formed metal framing and furring, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing and furring that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.

19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

3. Grade: As required by structural performance.
4. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING AND FURRING SYSTEMS

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: by design.
2. Flange Width: by design.

Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

3. Minimum Base-Metal Thickness: Matching steel studs.
4. Flange Width: 1-1/4 inches.

Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

5. 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:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.

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, and as follows:

6. 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:
7. Minimum Base-Metal Thickness: as indicated.

8. Flange Width: 1 inch plus twice the design gap for other applications.

Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

9. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: by design.
 - b. Flange Width: 1 inch plus twice the design gap for other applications
10. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: by design.
 - b. Flange Width: by design

Steel Furring: ASTM C645; Manufacturer's standard hat-shaped steel furring channels, unpunched, with unstiffened flanges, and as follows:

11. Minimum Base-Metal Thickness: 16 gauge.
12. Depth: 7/8 inch.

2.4 FRAMING ACCESSORIES

Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

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.

2.5 ANCHORS, CLIPS, AND FASTENERS

Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

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.

Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

Shims: Load bearing, high-density multi-monomer plastic, non-leaching.

Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

Fabricate cold-formed metal framing, furring 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 and furring members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing and furring members by welding, screw fastening, clinch fastening, or riveting 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 metal framing and furring by welding, bolting, or screw fastening, according to Shop Drawings.

Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

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:

5. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
6. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine supporting substrates 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 PREPARATION

Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

Cold-formed metal framing and furring may be shop or field fabricated for installation, or it may be field assembled.

Install cold-formed metal framing and furring according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

Install shop- or field-fabricated, cold-formed framing and furring, 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**.

Install cold-formed metal framing, furring and accessories plumb, square, and true to line, and with connections securely fastened.

2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal 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.

Install framing and furring members in one-piece lengths unless splice connections are indicated for track or tension members.

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.

Do not bridge building expansion and control joints with cold-formed metal framing or furring. Independently frame both sides of joints.

Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

4. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

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

Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated.
2. Stud Spacing: As indicated.

Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

3. Install single-leg deflection tracks and anchor to building structure.
4. Install double deep-leg deflection tracks and anchor outer track to building structure.
5. Connect vertical deflection clips to infill studs and anchor to building structure.

6. Connect drift clips to cold formed metal framing and anchor to building structure.

Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

7. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. 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.
 - a. Install solid blocking at 96-inch centers.
8. 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.
9. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

Install furring, 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.

3.5 FIELD QUALITY CONTROL

Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

Field and shop welds will be subject to testing and inspecting.

Testing agency will report test results promptly and in writing to Contractor and Architect.

Remove and replace work where test results indicate that it does not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of work is indicated on Drawings.
- B. This section includes the following metal fabrications:
 - (1) Bearing and leveling plates.
 - (2) Loose steel lintels and edge angles.
 - (3) Miscellaneous framing and supports.
 - (4) Rough hardware.
 - (5) Steel handrails and guardrails at Mezzanine 135 and Mezzanine Stairs and at locations indicated on Drawings.
 - (6) Steel pipe bollards
- C. Gratings and Frames for New Storm Sewer System are specified in Division 2 Sections and on Civil Drawings.
- F. Metal Stairs to Mezzanine 135 are specified in Section 05510 "Metal Stairs".

1.03 SUBMITTALS

- A. General: Submit the following in accordance with conditions of contract and Division 1 Specification sections.
- B. Product Data and Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other section.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- B. Quality welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code-Steel," D1.3 "Structural Welding Code-Sheet Steel", and D1.2 "Structural Welding Code-Aluminum".
 - (1) Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

- A. Field measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.

1.06 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.

- (1) Comply with Railing Load Requirements of 2015 International Building Code.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal surfaces, general: For metal fabrications exposed to view upon completion of the work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel plates, shapes, and bars: ASTM A 36.
- C. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade as follows:
 - (1) Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:
 - (a) Grade A, unless otherwise indicated or required by design loading.
 - (2) Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:
 - (a) Grade 30, unless otherwise indicated or required by design loading.
- D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
 - (1) Cold-Rolled Steel Sheet: ASTM A 366.
 - (2) Hot-Rolled Steel Sheet: ASTM A 569.
- E. Galvanized Steel Sheet: Quality as follows:
 - (1) Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.
- F. Cold-Formed Steel Tubing: ASTM A 500.
 - (1) For exterior installations, where indicated on Drawings, provide tubing with hot-dip galvanized coating per ASTM A 53.
- G. Gray Iron Castings: ASTM A 48, Class 30.
- H. Malleable Iron Castings: ASTM A 47, grade 32510.

- I. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported items, unless otherwise indicated.
- J. Stainless Steel: AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; 26 Gage.
- K. Concrete Inserts: Threaded or wedge, type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- L. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

- A. Non-shrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.
- B. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:
 - (1) Non-shrink Metallic Grouts:
"Hi Mod Grout"; Euclid Chemical Co.
"Embeco 885 and 636"; Master Builders
"Ferrolith G Redi-Mix and G-NC"; Sonneborn Building Products Div.,
 - (2) Non-shrink Nonmetallic Grouts:
"Euco N-S Grout"; Euclid Chemical Co.
"Masterflow 713"; Master Builders
"Sonogrout"; Sonneborn Building Products Div.,
 - (3) Erosion-Resistant Anchoring Cement
"Super Por-Rok"; Minwas Construction Products Division

2.03 FASTENERS AND MISCELLANEOUS MATERIALS:

- A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.
- C. Lag Bolts: Square head type, FS FF-B-561.

- D. Machine Screws: Cadmium plated steel, FS FF-S-92.
- E. Wood Screws: Flat head carbon steel, FS FF-S-111.
- F. Plain Washers: Round, carbon steel, FS FF-W-92.
- G. Drilled-in Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, non-drilling), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.
- H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
- I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
- J. Solder: For use with stainless steel, provide 60-40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.
- K. 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, non-corrosive, size and gage required for performance.

2.04 PAINT

- A. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.
- B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.
- C. Zinc Chromate Primer: FS TT-P-645.

2.05 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the maximum change (range) in ambient temperature in the design, fabrication and installation of installed metal assemblies to prevent buckling, opening up of joints, and over stressing of welds and fasteners.
- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with AWS recommendations and 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 that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. 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.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.07 BEARING AND LEVELING PLATES

- A. Provide bearing and leveling plates (if any) for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.08 LOOSE STEEL LINTELS and EDGE ANGLES

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions, at edge of slab at overhead doors and other locations as indicated. Slab edge angles are to be galvanized.

2.09 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware, hangers, and similar items.

2.10 STEEL PIPE HANDRAILS

- A. General: Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.
- B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 - (1) At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
- C. Form changes in direction of railing members as follows:
 - (1) By radius bends of radius indicated.
 - (2) By mitering at elbow bends, unless otherwise indicated to have radius bend.
- D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
- E. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.
- F. Bracket, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work, as shown on Drawings and as required. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete, masonry or other miscellaneous steel work.
- G. Provide wall returns at ends of wall-mounted handrails.

2.11 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
 - (1) ASTM A 153 for galvanizing iron and steel hardware.
 - (2) ASTM A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - (1) Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".
 - (2) Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirement of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instruction, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set Sleeves, if any, in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, welds at steel substrates, and other connectors as required.
- B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
- D. 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 the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and 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 blend so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum or stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.03 SETTING LOOSE PLATES AND ANGLES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates and angles on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
- (1) Use metallic non-shrink grout in concealed locations where not exposed to moisture; use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.
 - (2) Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS

- A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts and/or railing wall brackets at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
- (1) Where indicated, anchor rail ends into concrete masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

3.05 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting", of these specifications.
- B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05510 - METAL STAIRSPART 1 - GENERAL1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - (1) Straight run, steel-framed stairs, for interior stairs to Mezzanine 135, as indicated on Drawings.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - (1) Division 5 Section 05500 "Metal Fabrications" for pipe and tube handrails and guard rails integral to metal stairs and removable, protective railing at Mezzanine.
 - (2) Division 9 Section 09900 "Painting" for finish painting of metal stairs.

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and install steel stairs to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of steel stairs.
 - (1) Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
 - (2) Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft.
 - (3) Stair Framing: Capable of withstanding stresses resulting from loads specified above as well as stresses resulting from railing system loads.

1.04 SUBMITTALS

- A. Product data for metal stair components and accessories.
- B. Shop drawings detailing fabrication and installation of steel stairs. Include plans, elevations, sections, and details of steel stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.
 - (1) For installed steel stairs indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing steel stairs similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.
- B. Installer Qualifications: Arrange for steel stair installation specified in this Section by the same firm that fabricated them.
- 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 stairs (including handrails and railing systems) similar to this Project in material, design, and extent and that have a record of successful in-service performance.
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 ^AStructural Welding Code-Steel[@] and AWS D1.3 "Structural Welding Code-Sheet Steel."
 - (1) Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, except ASTM 992 (Grade 50) for W shapes.
- C. Steel Tubing: Product type (manufacturing method) and as follows:
 - (1) Cold-formed Steel Tubing: ASTM A 500.
 - (2) Hot-formed Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
- E. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.02 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head type, ASTM A 325 high strength and nuts, ASTM A 563 (ASTM A 563M), and where required, flat washers.

- B. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- F. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- G. Expansion Anchors: anchor bolt and sleeve assemblies of material indicated below with capacity to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.03 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.04 GROUT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

- A. Form steel stairs from materials of size, thickness, and shapes indicate, but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Shear and punch metals cleanly and accurately.
- D. Remove sharp or rough areas on exposed surfaces.
- E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. 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 that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- H. Shop Assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and coordinated installation.

2.07 STEEL-FRAMED STAIRS

- A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, struts, clips, brackets, bearing plates, or other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.
 - (1) NAAMM Stair Standard: Comply with Recommended Voluntary Minimum Standards for Fixed metal Stairs in NAAMM Metal Stair Manual for class of stair designated, except where more stringent requirements are indicated.
- B. Stair Framing: Fabricate stringers of structural steel tubes, or a channel-plate combination, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. bolt or weld headers to stringers; and bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.
 - (1) Where concrete structure supports steel stairs, provide temporary supporting struts designed for erecting steel stair components as necessary.
- C. Bar-Grate Type Metal Treads, and Platforms: As indicated on Drawings. Shape metal treads and platforms to conform to configuration shown. Provide thicknesses of structural steel as required to support total design loading.
 - (1) Attach treads and platforms to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal treads and platforms to brackets by welding, riveting, or bolting.
 - (2) Treads to include nosing integral with tread.
 - (3) Provide sub-platforms in configuration and thicknesses as required to support design loading. Attach sub-platform to platform framing members with welds.

2.08 FINISHES

- A. General: Finish metal stairs after assembly.
 - (1) Comply with NAAMM Metal Finishes Manual for recommendations on application and designations of finishes.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed units:
 - (1) Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning".

- C. Apply shop primer to uncoated surfaces, except those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, weld plates, and anchor bolts. Coordinate delivery of such items to Project site.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing steel stairs. Set units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. 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 the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted field connections.
- E. 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 that no roughness shows after finishing and welded surface matches contours of adjoining surface.

3.03 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on steel stairs are specified in Division 9 Section 9.01 Painting.

END OF SECTION 05510

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
- B. Related Sections:
 - 1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use ASD; data are given at service-load level.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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. For structural-steel connections indicated to comply with design loads, include structural analysis data.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer fabricator professional engineer testing agency.
- B. Welding certificates.
- C. Product Test Reports: For the following:
1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
- D. Source quality-control reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- C. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
 2. AISC 341 and AISC 341s1.
 3. AISC 360.

4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 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 F 1852 fasteners and for retesting fasteners after lubrication.

1.9 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.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

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

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- C. Unheaded Anchor Rods: ASTM A 36/A 36M.
 - 1. Configuration: Hooked.
 - 2. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- D. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
 - 2. Washers: ASTM A 36/A 36M carbon steel.
 - 3. Finish: Plain.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

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

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel 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, cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

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

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 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 attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.

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, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
- C. Maintain erection tolerances of structural steel within AISC's "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.
 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 unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

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

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 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 Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Roof deck.
- 2. Composite floor deck.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Roof deck.
- 2. Composite floor deck

- B. Shop Drawings:

- 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230) G60 (Z180) zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: 1-1/2 inches (38 mm) 2 inches (190 mm).
 - 4. Design Uncoated-Steel Thickness: As indicated.
 - 5. Span Condition: Triple span or more.
 - 6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Profile Depth: 3 inches (76 mm).
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.4 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Galvanizing Repair Paint: ASTM A780/A780M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
 - 1. Weld Diameter: 5/8 inch (16 mm), nominal.
 - 2. Weld Spacing: as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches (457 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped 2 inches (51 mm) minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.4 INSTALLATION OF FLOOR DECK

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: 5/8 inch (16 mm), nominal.
 - 2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
 - 2. Mechanically clinch or button punch.
 - 3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
 - 1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

END OF SECTION 053100

SECTION 054400 - COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof trusses.

1.2 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- B. Delegated-Design Submittal: For cold-formed steel trusses.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product test reports.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel trusses.
- B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
 - a. Roof Trusses: Vertical deflection of 1/240 of the span.
- C. Cold-Formed Steel Truss Standards: Unless more stringent requirements are indicated, trusses shall comply with the following:
 - 1. Roof Trusses: AISI S214.

2.2 COLD-FORMED STEEL TRUSS MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60 (Z180), A60 (ZF180)

2.3 ROOF TRUSSES

- A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.
 - 1. Connecting Flange Width: 1-5/8 inches (41 mm), minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
 - 2. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm)

2.4 TRUSS ACCESSORIES

- A. Fabricate steel-truss accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for truss members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel headless, hooked bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
- C. Power-Actuated Fasteners: 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.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780/A780M.
- B. Shims: Load-bearing, high-density multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as truss members supported by shims.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

3.2 INSTALLATION

- A. Install bridge, and brace cold-formed steel trusses according to AISI S200, AISI S202, AISI S214, and manufacturer's written instructions unless more stringent requirements are indicated.

1. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure.
 2. Install continuous bridging and permanently brace trusses as indicated on Drawings, as indicated on Shop Drawings and designed according to CFSEI's Technical Note 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
- B. Install cold-formed steel trusses and accessories true to line and location, and with connections securely fastened.
- C. Install temporary bracing and supports to secure trusses and support loads equal 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 trusses are secured.
- D. Truss Spacing: As indicated on Drawings.

3.3 ERECTION TOLERANCES

- A. Install cold-formed steel trusses level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel trusses with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Cold-formed metal trusses will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 054400

SECTION 06100 - ROUGH & FINISH CARPENTRY

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Definition: Rough and finish carpentry includes carpentry not specified as part of other sections which may be covered by other work. Types of rough and finish carpentry included in this section are:
 - (1) Wood framing and blocking.
 - (2) Plastic laminate for *Casework* counters.
 - (3) Plywood backing panels or backboards
 - (4) Ornamental square tapered PVC column surrounds.
- B. Related Section: Section 12345 Casework for Classroom/Training 101, Workroom 107, Supplies 110, Radio Room 111, Passage 112A, Cabinets at Kitchen 114, Baths 125 and 127, Laundry & Decontamination 130 and Bunk Room Wardrobe Units and Desks.

1.03 SUBMITTALS

- A. Wood treatment data: Submit treatment manufacturer's instructions for proper use of each type of treated material.
 - (1) Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.
 - (2) For Water-borne Preservatives, include statement that moisture content of treated materials was reduced to a max. of 15% prior to shipment to project site.

1.04 MATERIAL HANDLING AND PROTECTION

- A. All lumber and carpentry items shall be handled and stacked off the ground so as to protect them against damage. They shall be protected from the weather while in transit and after delivery to the site. All other material such as nails, bolts, etc. shall be protected and not allowed to rust. Store materials at temperature and humidity conditions recommended by manufacturers.

PART II - MATERIALS

2.01 GENERAL

- A. Lumber which is to become a permanent part of the building shall be No. 2 common dimension Southern Yellow Pine, S4S to standard yard sizes and shall, where necessary, be job or mill ripped to sizes indicated on Drawings. Lumber shall be kiln dried to a moisture content of 19% or less. Lumber required to be treated shall be pressure treated with Wolman salts or approved equal, to a net retention of 0123 lbs. per cu. ft. in accordance with FS TT-W-571. Treated lumber shall be so marked. If

- lumber is cut or sawed after treating shall be brush-coated or dipped with same preservative used at plant.
- B. All other lumber (stud wall blocking, plates other than pressure treated, etc.) which is to become a permanent part of the building in this category, shall be No. 2 common dimension Spruce, S4S to standard yard sizes and shall, where necessary, be job or mill ripped for sizes indicated on the Drawings.
- C. Plywood:
- (1) APA Grade "C-D", exterior glue, conforming to PSI-83, except A-D Grade at interior counters to receive plastic laminate.
- D. Bolts, nuts and washers shall be non-corroding type. Types and sizes shall be as indicated on Drawings or as required to complete the Work.
- E. Nails shall comply with FS FF-N-101 and shall be cement coated, except use finishing type at finish carpentry items.
- F. Plastic laminate top, vertical facings, and edges over plywood backing for counters:
- (1) Plastic laminate shall be NEMA with satin finish as manufactured by Formica, Wilson-Art, Nevamar, or approved equal, in standard colors and pattern selected by Architect.
- (a) General purpose grade: .050" thick, NEMA LD3-1980, type GP-50.
- G. Ornamental Square, Tapered PVC Column Surrounds:
- (1) Square Tapered Column with Tuscan Capital and Base (Plan Type E).
- a. Nominal Size: 6'-0" high x 8" top x 12" base
- b. Acceptable Manufacturer: Equal to Endura-Craft #EC1206ETPTUTU as distributed by The Architectural Depot @ architecturaldepot.com

PART III - EXECUTION

- 3.01 INSTALLATION: Execute rough and finish carpentry in best substantial manner. Size framing, blocking, furring, panels, etc. as shown. Bolt to concrete and masonry as shown. Bolts shall be drawn up tight; countersink and fill bolts and nails at exposed locations. Thoroughly secure framing, panels and trim. Install blocking wherever shown or as required to maintain framing rigid, or provide adequate substrate for paneling and trim application.
- 3.02 INSTALLATION OF PLYWOOD
- A. Comply with recommendations of American Plywood Association (APA).

END OF SECTION 06100

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Glued-laminated wood sheathing (plywood wall sheathing).
2. Fiberglass-mat faced, moisture resistant gypsum sheathing.
3. Plywood
4. Plywood and gypsum sheathing accessories.
5. Plywood decking.

B. Related Sections:

1. Division 5 Section 05400 "Cold Formed Framing" and Division 9 Section 09250 "Gypsum Drywall" for light-gauge steel stud and joist framing to receive plywood or glass mat gypsum sheathing board.
2. Division 6 Section 06100 "Rough Carpentry" for dimension lumber items associated with wood sheathing and gypsum sheathing.
3. Division 7 Section 07240 "Exterior Insulation and Finish System" for installing glass mat gypsum board sheathing integral with exterior insulation and finish system.
4. Division 7 Section 073113 "Asphalt Shingles" for installing plywood decking integral to vented nail-base insulation installed with shingle roofing system.

1.3 DEFINITIONS

- A. Plywood grading agencies, and the abbreviations used to reference them, include the following:

1. APA: The Engineered Wood Association.
2. AWP: American Wood Preservers' Association.
3. SPIB: The Southern Pine Inspection Bureau.

- B. IBC: 2015 International Building Code

1.4 REFERENCES

- A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C518 Standard Test Methods for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
6. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
7. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

B. Gypsum Association:

1. GA-254 Application of Gypsum Sheathing.

1.5 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of wood decking and gypsum sheathing to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking and gypsum sheathing with surfaces that are to be exposed in the final Work protected from exposure to sunlight.
- C. When handling plywood, avoid dropping panels on edges to prevent splintering or chipping.

1.7 JOB CONDITIONS

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring strips, nailers, blocking, framing members and similar supports to allow proper attachment other work.
- B. Once wood material has been installed, protect by applying temporary covering, siding and roofing as soon as possible.
- C. All pressure-preservative-treated lumber shall not to come in direct contact with any metal components, including steel decking. All treated wood blocking, nailers, framing members, curb supports, decking and plywood sheathing must be separated from metals with one

course of elastomeric underlayment unless an alternate method of separation is indicated or specified in other divisions of this Project Manual.

1.8 WARRANTY

- A. Provide gypsum sheathing products that offer twelve (12) months of coverage against in-place exposure damage (delamination, deterioration and decay).
- B. Manufacturer's Warranty:
 - 1. Five (5) years against manufacturing defects.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

- A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

2.2 WOOD-PRESERVATIVE-TREATED

- A. Preservative Treatment by Pressure Process: AWPAC2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX)].
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Plywood, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 GLUED-LAMINATED WOOD SHEATHING

- A. Provide engineered wood products that comply with APA standards; The Engineered Wood Construction Guide. Only products bearing the APA trademark will be accepted for use on this project.
 - 1. Laminating Adhesive: Wet-use type complying with ASTM D 2559.
 - 2. Species: Southern pine.
 - 3. Grade: C-D Group 1
 - 4. Exposure Durability Classification: Exterior

5. Decking Nominal Size: 4 x 8.
6. Nominal Thicknesses: ½ inch or ¾ inch, as indicated on drawings.
7. Edge Pattern: Square-edge.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 2. Low Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
 3. Products:
 - a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start "HR" High Performance Roofing Underlayment.
 - b. Grace, W. R. & Co.; Vycor Ultra.
 - c. Henry Company; Perma-Seal PE.

2.5 WOOD SHEATHING FASTENERS

- A. Provide fastener size, spacing and type complying with recommendations of American Plywood Association, and the following:
1. Where exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153.
 2. Nails, Wire, Brads and Staples: FS FF-N-105.
 3. Power Driven Fasteners: National Evaluation Report NER-272, for power driven nails, screws or staples used in all types of building construction, issued by ICC-ES to ISANTA.
 4. Wood Screws: ANSI B18.6.1.
 5. Lag Bolts: ANSI B18.2.1.

2.6 FIBERGLASS-MAT FACED, MOISTURE RESISTANT GYPSUM SHEATHING

- A. Available Manufacturers: The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to ten (10) day prior approval.
- B. Available manufacturers: The following manufacturer and product has been accorded preliminary approval:

Georgia-Pacific Gypsum LLC: Fiberglass-Mat Faced Gypsum Sheathing **DENSGLOSS GOLD**.

- C. Manufacturers wishing to bid must submit the following to the Architect no less than ten (10) days prior to the bid date:

1. Manufacturer's Product Data.
2. Certified test reports showing conformance with requirements as specified.
3. Approval shall be by written addendum only. Verbal approval will not be given.

- D. Materials: Fiberglass-Mat Faced Gypsum Sheathing (ASTM C1177):

1. Thickness: 1/2 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 1,900 pounds per M square feet.
5. Edges: Square.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 PSF, dry.
8. Flexural Strength, Parallel (ASTM C472): 80 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/4 inch.
10. Permeance (ASTM E96): 23 perms.
11. R-Value (ASTM C518): 0.56.

- E. Accessories:

1. Screws: ASTM C1002, corrosion-resistant treated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions / Inspection: Verify that project conditions and substrates are acceptable to the installer, prior to beginning work of this section.
- B. Examine walls and support framing in areas to receive wood decking and gypsum sheathing, for compliance with installation tolerances and other conditions affecting performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Install additional fasteners as required to comply with project wind uplift requirements.

3.2 INSTALLATION

- A. Install laminated wood sheathing as required to comply with the APA "Engineered Wood Construction Guide".
 1. Install wood sheathing with long joints in a continuous straight line with end joints staggered between rows a minimum of 24 inches, 48 inches where possible. Provide metal "H" clips at all unsupported edges, creating 1/8 inch spacing at all edge and end joints.

- B. Attach all plywood to substrate framing. Anchor with specified fasteners to resist building code wind loading requirements unless a more stringent fastening rate is specified.
 - 1. Fasten plywood at 6" centers into each support.
- C. Examine support framing in areas to receive wood sheathing, for compliance with installation tolerances and other conditions affecting performance of wood sheathing.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Provide pressure-preservative-treated plywood of indicated thicknesses.
 - 1. Provide elastomeric underlayment where pressure treated lumber will be in contact with sheet steel components; steel deck, sheet metal flashings, bent angle plates, etc. unless an alternate method of separation is indicated or specified in other specification divisions of this Project Manual.
- E. Gypsum Sheathing: Install in strict accordance with ASTM C1280 and with manufacturer's written recommendations.
 - 1. Install per the current product catalog of Georgia-Pacific Gypsum, or equal.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking and sheathing if repairs are not approved by Architect.

3.4 PROTECTION

- A. Provide temporary waterproof covering as the Work progresses to protect roof decking and gypsum sheathing until roofing and other covering materials are applied.
- B. Coordinate with requirements for underlayment in Division 7 Roofing Sections.

END OF SECTION 06160

SECTION 06650 - SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specifications sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of solid polymer fabrications is indicated on Drawings and as follows:
 - (1) Countertops and Edges at locations indicated. See Interior Elevations and Details.
- B. Related Work specified elsewhere:
 - (1) Division 6 Section "Rough Carpentry" for plywood backing at solid polymer surfaces.
 - (2) Division 6 Section "Finish Carpentry".
 - (3) Division 12 Section 12304 "Modular Laminate Casework".

1.03 REFERENCES

- A. Applicable Standards: Standards of the following, as referenced herein:
 - (1) American National Standards Institute (ANSI)
 - (2) American Society for Testing and Materials (ASTM)
 - (3) National Electrical Manufacturer's Associations (NEMA)
 - (4) Federal Specifications (FS)

1.04 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 2"x 2" (50mm x 50mm) samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.
- C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.05 QUALITY ASSURANCE

- A. Allowable tolerances:
 - (1) Variation in component size: (3mm).
 - (2) Location of openings: (3mm) from indicated location.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.07 WARRANTY

- A. Provide manufacturer's 10-year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. For purpose of determining minimum performance and quality standards, this specification is based upon **Formica Solid Surfacing™** solid polymer fabrications as manufactured by Formica Corporation.
- B. Equal products by Dupont (Corian), WilsonArt International, Nevamar, Samsung (Staron), will be accepted.
- C. Equal products of other manufacturers will be considered, subject to submission in accordance with the "Prior Approval" section of these specifications.

2.02 MATERIALS

- A. Homogenous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & 6, Type Six, and Fed. Spec. WW-P-541E/GEN.
 - (1) Flame Spread: Less than 25
 - (2) Smoke Developed: Less than 25
 - (3) Superficial damage to a depth of 0.010" (.25mm) shall be repairable by sanding and polishing.
- B. Thickness: ½", as indicated on Drawings.
- C. Pattern and Color: Equal to **Formica Solid Surfacing, Classic Series; #654 "Botanical Mosaic"**. Pattern and color selection are intended to establish a price range for solid polymer fabrications. The Architect reserves the right to select other standard patterns and colors within the established price range.

2.03 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond. (Technical Bulletin: CTDC 102).
- B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color matching or clear formulations. (Technical Bulletin: 102, 127).

2.04 FABRICATION

- A. Fabrication shall be performed by a company certified by the manufacturers.

- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements.
- C. Form joints between components using manufacturer=s standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" (50mm) wide reinforcing strip under each joint.
- D. Rout and finish component edges to a smooth, uniform finish as detailed. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- E. Finish: All surfaces shall have uniform finish.
 - (1) Matte, with a gloss rating of 5-20.

PART 3 - EXECUTION

3.01 JOB MOCK-UP

- A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for Architect review. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.
- B. Approved mock-ups may remain as part of finished work.

3.02 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
 - (1) Edge Treatment: Ease edges as indicated on Drawings.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- D. Protect surfaces form damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to Architect's satisfaction.
- E. Provide manufacturer's care and maintenance recommendations to Architect at project close out. Review same with Owner's maintenance personnel.

END OF SECTION 06650

SECTION 07160 – DAMP-PROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of damp-proofing work is indicated on drawings.
- B. Following types and applications of work are specified in this section:
 - (1) Cold-applied asphalt emulsion damp-proofing.
- C. Similar work used as exposed finish is excluded by definition and, if required, is specified as waterproofing, vapor retarder roofing, flooring, special coating or another appropriate category.

1.03 QUALITY ASSURANCE

- A. General: For each type of work, obtain primary materials from single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer Qualifications: A firm which has specialized for not less than three years in installation of types of damp-proofing required for project and which is acceptable to manufacturer of primary materials.

1.04 JOB CONDITIONS

- A. Substrate: Proceed with damp-proofing work only after substrate construction and penetrating work have been completed.
- B. Weather: Proceed with damp-proofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer=s recommendations.

PART 2 - PRODUCTS

2.01 COLD-APPLIED ASPHALT EMULSION DAMPPROOFING

- A. Asphalt Emulsion: Manufacturer's standard asphalt and water emulsion coating, recommended for applications to either damp (green) or dry substrates, compounded to penetrate substrate and build to moisture-resistant coating.
 - (1) Provide **non-fibrated** type liquid asbestos-free emulsion; ASTM D1227, Type III.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt emulsion products which may be incorporated in the work include, but are not limited to, the following:

Celotex Corporation.
Karnak Chemical Corporation
Koppers Company, Inc.
Manville Building Products Corp.
Sonneborne Bldg Products/Rexnord Chemical Products Inc.
Tamko Asphalt Products, Inc.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBSTRATE

- A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.
- B. Fill voids, seal joints, and apply bond breakers (if any) as recommended by prime materials manufacturer, with particular attention to construction joints.
- C. Install separate flashings and corner protection stripping as recommended by prime materials manufacturer, where indicated to precede application of damp-proofing. Comply with details shown and manufacturer's recommendations.
- D. Protection of other Work: Do not allow liquefied and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

3.02 INSTALLATION

- A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.
- B. Asphalt Emulsion on Exterior Surfaces:
- (1) Apply coat of liquid, asphalt emulsion damp-proofing material, by brushing or spraying onto substrate as follows:
- (a) Apply at rate of 1.5 to 2.5 gallons per 100 sq. Ft., depending upon substrate texture, as required to produce uniform dry film thickness of not less than 15 mils. Apply in 2 coats if necessary to obtain required thickness, allowing time for complete drying between coats.
- C. Damp-proofing shall be applied over the entire surface of concrete and concrete block (unless otherwise noted or indicated), and around all joints, grooves and slots following all breaks in the surface.

END OF SECTION 07160

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part-1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect Work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include the following:
 - (1) Un-faced Blanket-type Building Insulation where indicated on Drawings at the following locations:
 - (b) Ceiling Insulation at bottom chord of all roof trusses occurring at Type 2 Roof System.
 - (c) Exterior metal stud framing at locations shown on Wall Sections.
- D. Weather Barrier Membranes over sheathing are specified in Division 7 Section 07250 "Weather Barriers."
- E. Rigid Insulation as part of Exterior Insulation and Finish System (E.I.F.S.) is specified in Division 7 Section 07240 "Exterior Insulation & Finish System."
- F. Safing Insulation at fire-rated construction is specified in Division 7, Section 07270 "Fire-Stopping."
- G. Un-faced Sound Attenuation Blankets are specified in Division 9, Section 09250 "Gypsum Drywall".
- H. Plumbing and HVAC insulation is specified in Division 15 sections.

1.03 QUALITY ASSURANCE

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by R-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

- (1) Surface Burning Characteristics: ASTM E 84

- (2) Fire Resistance Ratings: ASTM E 119
- (3) Combustion Characteristics: ASTM E 136
- (4) All insulation materials shall be asbestos free.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation material required.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
 - (1) Manufacturers of Glass Fiber Insulation:
 - (a) CertainTeed Corp.
 - (b) Johns Manville, Inc.
 - (c) Owens-Corning Fiberglass Corp.

2.02 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
 - (1) Insulation shall be in thicknesses and R-values as indicated herein or on Drawings.
- B. Un-faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with **ASTM C 665** for **Type I** (blankets without membrane facing); and as follows:
 - (1) Mineral Fiber Type: Fibers manufactured from glass.
 - (2) Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively, when tested in accordance with ASTM E 84.
 - (3) Thermal Resistance (R) 30; per ASTM C518 for 10" thick blankets, at bottom chord of all roof trusses as indicated on Drawings.
 - (4) Thermal Resistance (R) 21; per ASTM C518 for 6" thick blankets, at exterior metal stud walls where indicated on Drawings.

2.03 AUXILIARY INSULATING MATERIALS

- A. Types recommended by insulation manufacturer, including insulation supports, clips, fasteners and other accessories.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected. Clean Substrates of substances harmful to insulations.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown (vertically and horizontally) over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units. Do not obstruct ventilation spaces, except for fire-stopping.
- B. Stuff loose glass fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).

3.04 CLEAN-UP AND PROTECTION

- A. Remove and dispose of excess insulation, wrappings and other waste materials. Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or where that is not possible, by temporary covering or enclosure.

END OF SECTION 07210

SECTION 07214 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect Work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. Extent of foamed-in-place insulation work is shown on drawings and indicated by provisions of this section.
- B. Foamed-in-place insulation occurs at all exterior wall concrete unit masonry, except at fully-grouted unit masonry wall areas.

1.03 SUBMITTALS

- A. Product and technical presentation as provided by the manufacturer.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.
- C. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CRF 1910 1200.

1.04 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.
- B. Installer Qualifications for Foamed-in-Place Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years experience in the installation of the product used.
- C. **Warranty: Provide one year product and installation warranty, issued by both the manufacturer and installer.**
- D. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
Fire Resistance Ratings: ASTM E-119
Surface Burning Characteristics: ASTM E-84
Combustion Characteristics: ASTM E-136

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers of Foamed-in-Place Insulation: Subject to compliance with requirements, provide products from the following:
 - 1. "Core-Fill 500"; Tailored Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28603, (800) 627-1687.
 - 2. "Tripolymer", C.P. Chemical Products, 25 Home Street, White Plains, New York, 10606
 - 3. "Rapco", Jesco, Inc., P.O. Box 13496, Florence, S.C. 29504

2.02 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards and other characteristics.
- B. Foamed-in-Place Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.
 - 1. Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E-119) for 8" and 12" concrete masonry units when used in standard two (2) hour rated CMUs.
 - 2. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 15, 75 and 0 respectively.
 - 3. Combustion Characteristics: Must be noncombustible, Class A building material.
 - 4. Thermal Values: R Value of 4.91/inch @ 32 deg. F mean; ASTM C-177.
 - 5. Sound Abatement: Minimum Sound Transmission Class ($ASTC$) rating of 53 and a minimum Outdoor Indoor Transmission Class ($AOITC$) rating of 44 for 8" wall assembly (ASTM E90-90).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Application Assemblies:
 - (1) Block Walls: 8" and 12" masonry units at exterior walls, as indicated on Drawings. See Summary Paragraph 1.02, above.

3.02 INSTALLATION OF FOAMED-IN-PLACE INSULATION

- A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry, structural steel and structural concrete work is in place; comply with manufacturer's instruction.

- B. Installation:

Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. For masonry, repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes in masonry with mortar and score to resemble existing surface.

END OF SECTION 07214

SECTION 07240 - EXTERIOR INSULATION AND FINISH SYSTEM

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of exterior insulation and finish systems (E.I.F.S.) is indicated on drawings.
- B. Types of Exterior Insulation and Finish System applications in this section include the following:
 - (1) Applications over gypsum sheathing at exterior wall metal stud framing where indicated on the drawings
 - (2) E.I.F.S. Accessories
- C. Metal Stud Framing is specified in Division 5, Section 05400 "Cold-Formed Metal Framing."
- D. Gypsum Sheathing is specified in Division 6, Section 06160 "Sheathing".
- E. Sealing joints is specified in Division 7, Section 07920 "Joint Sealants".

1.03 DEFINITIONS

- A. Exterior insulation and finish system refers to an exterior assembly composed of an inner layer of thermal insulation board and an outer layer forming the protective finish coating. The assembly is applied to a supporting substrate of construction indicated. Designations below for the class and type of exterior insulation and finish system specified in this section are based on those developed by the Exterior Insulation Manufacturers Association (EIMA).
 - (1) Class PB Type A designates a polymer-based protective finish coating (Class PB), externally reinforced (Type A).
 - (2) System shall have mildew-resistant coating.
- B. System in this section refers to Class PB Type A exterior insulation and finish systems.
- C. System manufacturer refers to the manufacturer of the exterior insulation and finish system.

1.04 SYSTEM DESCRIPTION

- A. Provide system complying with the following performance requirements:
 - (1) Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

- (2) System shall have been tested at full scale for impact resistance and structural load capacity per ASTM E72 and E330 respectively.
 - (3) Weather-tightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building which results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.
 - (a) System shall have been tested for moisture resistance, rain resistance, absorption-freeze, accelerated weathering, mildew resistance, salt spray resistance, chemical resistance, and abrasion resistance.
- B. Basis for Design (See Paragraph 2.01A, Page 5): **Dryvit Outsulation Plus MD System** is an Exterior Insulation and Finish System (EIFS), Class PB consisting of a secondary weather resistive barrier (Dryvit Backstop), adhesive (Dryvit Primus, Genesis, or Genesis DM) Dryvit reinforcing mesh, and Dryvit finish.
- (1) Design requirements:
 - (a) Acceptable Substrates shall include:
 - (1) Silicone treated gypsum core sheathing surfaced with inorganic fiberglass mats meeting ASTM C1177.
 - (2) Unglazed brick, cement plaster, concrete or concrete masonry.
 - (b) Deflection of the substrate systems shall not exceed 1/240 times the span.
 - (c) The substrate shall be flat within 6.4 mm (1/4" in a 1.2 m (4') radius.
 - (2) Performance requirements:
 - (a) **The Outsulation Plus MD System** shall have been tested for durability as follows:
 - (1) Abrasion Resistance: ASTM D968; no deleterious effects after 500 liters (132 gal).
 - (2) Absorption, Freeze-thaw: 60 cycles, slak at 20 deg. C (68 deg. F) for four days, then -10 deg. C (14 deg. F) for two hours, then 20 deg. C (68 deg. F) for two hours; no checking, cracking, or splitting.
 - (3) Accelerated Weathering: ASTM G23 (Federal Test Standard 141A Method 6151); 2000 hours. No deterioration.
 - (4) Mildew Resistance: Mil Standard 810B; passes.
 - (5) Moisture Resistance: ASTM D2247 (Federal Test Standard 141A Method 6201); no deleterious effects after 14 days.
 - (6) Salt Spray Resistance: ASTM B117 Federal Test Standard 141A Method 6061; 5% concentration for 300 hours. No deleterious effects.
 - (7) Air leakage: ASTM E283; less than 0.301 l/min/m² (.001 cfm/ft²) classified as a Type III air barrier as defined by the National Research Council of Canada.
 - (8) Water Penetration: ASTM E331; no water penetration to the inner most surface of the test specimen.
 - (9) Drainage: ASTM E331; 97% drainage efficiency.
 - (10) Water Vapor Transmission: ASTM E96 Procedure B; Standard lamina: 10 g/hr.m² (14 gr/hr.ft²).
 - (b) **The Outsulation Plus MD System** shall have been tested for structural performance as follows:

- (1) Tensile Bond Strength: ASTM C297.
 - (a) Backstop to exterior grade gypsum sheathing: 62.7 kPa (9.1 psi) sheathing facer failure.
 - (b) Backstop to Dens-Glass Gold: 199 kPa (28.8 psi) sheathing facer failure.
 - (c) Backstop to concrete/concrete block: 290 kPa (42.07 psi) substrate failure.
 - (d) Primus to Backstop: Minimum 86.9 kPa (12.6 psi).
 - (e) Genesis to Backstop: Minimum 104 kPa (15.1 psi).
- (2) Full Scale Structural Tests: ASTM E330; minimum failure load under positive or negative load of 4.3 kPa (90 psf) unless otherwise specified; substrate failure.
- (3) Impact Resistance: In accordance with EIMA Standard 101.86. Refer to table below: Panzer mesh used in conjunction with Standard mesh is recommended for areas exposed to high traffic.

Reinforcing Mesh/Weight g/m ² (oz/yd ²)	EIMA Impact Classification	EIMA Impact Range Joules (In-lbs)	Impact Test Results Joules (In-lbs)
Standard™ - 146 (4.3)	Level 1	3-6 (25-49)	4 (36)
Standard Plus™ - 203 (6)	Level 2	6-10 (50-89)	6 (56)
Intermediate ^R - 407 (12)	Level 3	10-17 (90-150)	12 (108)
Panzer ^R 15* - 509 (15)	Level 4	>17 (>150)	18 (162)
Panzer 20* - 695 (20.5)	Level 4	>17 (>150)	40 (352)
Detail ^R Short Rolls - 146 (4.3)	n/a	n/a n/a	n/a n/a
Corner Mesh - 244 (7.2)	n/a	n/a n/a	n/a n/a

*Shall be used in conjunction with Standard Mesh

- (c) **The Outsulation Plus MD System** shall have been tested for fire performance as follows:
 - (1) Surface burning Characteristics: ASTM E84:
 - (a) The EPS insulation board shall have a Flame Spread index not exceeding 25 and a Smoke Developed index not exceeding 450.
 - (b) The adhesives and coatings shall have a Flame Spread index not exceeding 20 and a Smoke Developed index not exceeding 10.
 - (2) ASTM E108 (Modified) Full Scale Fire Test; passed.
 - (3) UBC 26-9 Intermediate Scale Multi-Story Test (ISMA); passed.
 - (4) Ignitability Characteristics: BOCA National Building Code Radiant Heat Exposure Test of Exterior Wall Assemblies; passed.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's technical data for each component of exterior insulation and finish system.

- B. Samples for Initial Selection Purposes: Manufacturer=s standard color charts, trim accessory samples, and small scale samples indicating textural choices available.
 - (1) Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available.
 - (2) Color and Texture of new exterior insulation and finish system shall be selected from the manufacturer's standard palette of colors and textures.
 - (3) Samples for Verification Purposes: Samples, 2' square, for each finish, color and texture indicated; prepare samples using same tools and techniques intended for actual work.
 - (4) Obtain Architect's acceptance of samples before start of final work.
 - (5) Incorporate within each sample a typical control joint filled with sealant of color indicated or selected.
 - (6) Retain samples during construction for judging completed work.
- C. Installer certificates signed by manufacturer certifying that Installers comply with specified requirements.
- D. Test reports for system from a qualified independent testing laboratory certifying and interpreting test results relative to system=s compliance with requirements for fire performance characteristics, bond integrity and material properties.
- E. Sealant compatibility and test report from sealant manufacturer certifying that materials forming joint substrates of system have been tested for compatibility and adhesion with joint sealant; include sealant manufacturer=s interpretation of results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction which evidence system=s compliance with building code in effect for project.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm regularly engaged in manufacturing products for system indicated and with at least 5 years successful experience in applications similar to that required for this Project.
- B. Installer Qualifications: Engage an Installer that is certified in writing by system manufacturer as qualified for installation of systems indicated.
- C. Single Source Responsibility: Obtain materials for system from either a single manufacturer or from manufacturers approved by the system manufacturer as compatible with other system components.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original, unopened packages with manufacturer's labels identifying products legible and intact.

- B. Store materials inside and under cover; keep them dry, protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage from construction traffic and other causes.
- C. Stack insulation board flat and off the ground.

1.08 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install system when ambient outdoor temperatures are 40°F and falling unless temporary protection and heat is provided to maintain ambient temperature above 40°F during installation of wet materials and for 24 hours after installation or longer to allow them to become thoroughly dry and weather resistant.

1.09 SEQUENCING AND SCHEDULING

- A. Sequence installation of system with related work specified in other sections to ensure that wall assemblies, including flashing, trim and joint sealers, are protect against damage from weather, aging, corrosion, or other causes.

1.10 WARRANTY

- A. **Provide a five (5) years minimum limited warranty for materials and workmanship.**

PART 2 - MATERIALS

2.01 MANUFACTURERS

- A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to submission in accordance with the Prior Approval section of these specifications.

DRYVIT Systems, Inc. - **Outsulation Plus MD** System (Basis of Design)

- B. Other pre-approved system and manufacturer:

Finestone Pebbletex Class PB (Type A) Wall System manufactured by Master Builders Solutions.

2.02 MATERIALS

- A. Compatibility: Provide adhesive, mechanical fasteners, board insulation, reinforcing fabrics, base and finish coat materials, and trim accessories which are compatible with one another and approved for use by system manufacturer.
- B. Provide colors and texture of protective coating to comply with following requirements:
 - (1) Provide selection made by Architect from manufacturer's full range of standard colors and textures available for type of finish coat indicated.

- C. Surface-Sealer: System manufacturer's standard adhesion intermediary designed to improve bond between substrate of type indicated and adhesive for application of insulation.
- D. Molded Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with F.S. HH-1-524C ASTM C578 for Type I; nominal 1.0 PCF density; aged in block form prior to cutting and shipping by air drying for not less than 6 weeks or by another method approved by system manufacturer and producing equivalent results; 2' x 4' x thicknesses indicated on Drawings, but not less than the minimum thickness allowed by system manufacturer for corner squareness and other dimensional tolerances.
- E. Reinforcing Fabric: Balanced, alkali-resistant open weave glass fiber fabric treated for compatibility with other system materials; made from continuous multi-end strands with tensile strength of not less than 120 lbs and 140 lbs. in warp and fill directions, respectively, per ASTM D1682 and complying with ASTM D578 and the following requirements:
 - (1) Weight of Standard Reinforcing Fabric: Not less than 3.75 oz. per sq. yd.
- F. Air/Weather Barrier: Shall provide an air and secondary weather barrier for the substrates listed in Section 1.02B (1), and include the following components:
 - (1) Dryvit Backstop: A 100% acrylic product, which is field mixed with Portland cement in a 1:1 ratio by weight.
 - (2) Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive.
 - (3) Dryvit Flashing Tape™: A high density, polyethylene backed, tape with a rubberized asphalt adhesive.
 - (4) Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.
- G. Dryvit AP Adhesive: A moisture cure urethane- based adhesive used to adhere the Dryvit Drainage Strip.
- H. Starter Trac (ST) and Starter Trac with Drip Edge (STDE): UV treated PVC "J" channels with weep holes manufactured by Plastic Components, Inc.
- I. Dryvit Drainage Strip: A corrugated plastic sheet material, which provides drainage.
- J. Adhesives/Base Coats: Use to adhere the insulation board to the air/weather barrier and to embed the reinforcing mesh on the face of the insulation board, shall be one of the following:
 - (1) Genesis: A fiber-reinforced, acrylic modified product, which is field mixed with Portland cement in a 1:1 ratio by weight.
 - (2) Genesis DM: A dry mix, polymer-based, fiber-reinforced product, which is field mixed with water.
 - (3) Primus: An acrylic polymer-based product, which is field mixed with Portland cement in a 1:1 ratio by weight.
 - (4) Dryvlex: A high percentage polymer-blend material which is field mixed with Portland cement in a 1:1 ratio by weight.
- K. Dryvit Finish: Shall be the type, color and texture as selected by the Architect, and shall be the following:

- (1) Medallion Series PMR: (Proven Mildew Resistance) Finishes: Water-based, acrylic finishes with integral color and texture:
- (2) Coatings, Primers and Sealers:
 - (a) As recommended by Manufacturer.

L. Water: Clean and potable.

M. Weep Tubes: Manufacturer's standard.

N. Accessories: Rigid Vinyl (Un-plasticized Polyvinyl Chloride – PVC); where recommended by the manufacturer; formulated for exterior use.

2.03 MIXING

- A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as approved by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates to determine if they are in satisfactory condition for installation of system. Do not proceed with installation of system until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling resulting from application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.
- B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.
- C. Substrate Preparation: Prepare and clean substrates to comply with system manufacturer's requirements to obtain optimum bond between substrate and adhesive for insulation.
 - (1) Apply surface sealer over substrates, if required by system manufacturer for improving adhesion.

3.03 INSTALLATION

- A. General: Comply with system manufacturer's current published instructions for installation of system as applicable to each type of substrate indicated.
- B. Adhesively or mechanically attach insulation to comply with the following requirements:
 - (1) Allow attached insulation to remain undisturbed for period prescribed by system manufacturer but not less than 24 hours, prior to beginning rasping and sanding insulation or application of base coat and reinforcing fabric.

- C. Interlock ends at internal and external corners.
- D. Abut boards tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between insulation boards. If gaps occur, fill with insulation cut to fit gaps exactly; insert without use of adhesive.
- E. Rasp or sand flush any irregularities project more than 1/32" from surface of insulation; do not create depressions deeper than 1/16".
- F. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes conforming to details indicated.
- G. Interrupt insulation where expansion joints are indicated in substrates behind exterior insulation and finish systems.
 - (1) Provide "aesthetic" joints at E.I.F.S. walls and soffits, as shown and indicated on Drawings.
- H. Form joints for sealant application by leaving gaps of width needed between adjoining insulation edges as well as between insulation edges and dissimilar adjoining surfaces projecting through insulation that produce joint widths indicated after encapsulation of joint substrates with base coat, reinforcing fabric, and finish coat.
 - (1) Treat exposed edges of insulation board, including those forming substrates of sealed joints within system or between system and other work, by encapsulating with base coat, reinforcing fabric, and finish coat.
 - (2) Coordinate flashing installation with installation of insulation to produce a wall system which does not allow water to penetrate behind protective coating.
- I. Apply base coat to exposed surfaces of insulation in minimum thickness specified by system manufacturer.
- J. Fully embed reinforcing fabric of weight indicated below in wet base coat to produce wrinkle-free installation with fabric continuous at corners and lapped or otherwise treated at joints to comply with system manufacturer's requirements.
- K. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

3.04 INSTALLATION OF JOINT SEALANTS

- A. Prepare joints to receive sealants, at locations indicated, to comply with applicable requirements of Division 7 section "Joint Sealants".

3.05 CLEANING AND PROTECTION

- A. Remove temporary covering and protection of other work. Promptly remove protective coatings from window and door frames, and any other surfaces outside areas indicated to receive protective coating.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, which ensures system being without damage or deterioration at time of substantial completion.

END OF SECTION 07240

SECTION 07250 – WEATHER BARRIERS

PART 1 – GENERAL

1.1 GENERAL

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.2 SECTION INCLUDES

- A. Weather barrier membrane
- B. Seam Tape
- C. Flashing
- D. Fasteners

1.3 REFERENCES

- A. ASTM International
 - 1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM C1193; Standard Guide for Use of Joint Sealants
 - 3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
 - 4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
 - 5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
 - 6. ASTM E96; Test Method for Water Vapor Transmission of Materials
 - 7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
 - 8. ASTM E2178; Test Method for Air Permeance of Building Materials
- B. AATCC – American Association of Textile Chemists and Colorists
 - 1. Test Method 127 Water Resistance: Hydrostatic Pressure Test
- C. TAPPI
 - 1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
 - 2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.4 SUBMITTALS

- A. Refer to Section 01300 Submittals.
- B. Product Data: Submit manufacturer current technical literature for each component.
- C. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.
- D. Quality Assurance Submittals
 - 1. Manufacturer Instructions: Provide manufacturer's written installation instructions.

- E. Closeout Submittals: Refer to Division 1 Section "Project Closeout".

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. Installation shall be in accordance with manufacturer's installation guidelines and recommendations.
 - 2. Source: Provide weather barrier & accessory materials produced by single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store weather barrier materials as recommended by system manufacturer.

1.7 SCHEDULING

- A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to ten (10) day prior approval.
- B. Available manufacturers: The following manufacturer and product has been accorded preliminary approval
 - (1) DuPont Building Innovations; 4417 Lancaster Pike, Chestnut Run Plaza 721, Wilmington, DE19805; 1-800-44-TYVEK (8-9835); <http://construction.TYVEK.com>.
 - (2) DuPont™ Tyvek® HomeWrap
- C. Manufacturers wishing to bid must submit the following to the Architect in accordance with the Prior Approval section of these specifications.
 - (1) Manufacturer's Product Data.
 - (2) Certified test reports prepared by an independent testing laboratory, showing conformance with the weather barrier requirements as specified.

- (3) Stated differences between the proposed window and units specified and shown on the Drawings.
- (4) Approval of submittals shall be by written addendum only. Verbal approval will not be given.

2.2 MATERIALS

- A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier equal to DuPont™ Tyvek® HomeWrap® and related assembly components.
- B. Performance Characteristics:
 - 1. Air Penetration: 0.007 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178, Type I per ASTM E1677.
 - 2. Water Vapor Transmission: 58 perms, when tested in accordance with ASTM E96, Method B.
 - 3. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
 - 4. Basis Weight: 1.8 oz/yd², when tested in accordance with TAPPI Test Method T-410.
 - 5. Air Resistance: 300 seconds, when tested in accordance with TAPPI Test Method T-460.
 - 6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.
 - 7. Tear Resistance: 6/6 lbs, when tested in accordance with ASTM D1117.
 - 8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 20

2.3 ACCESSORIES

- A. Seam Tape: 2 inch wide, DuPont™ Tyvek® Tape as manufactured by DuPont Building Innovations.
- B. Fasteners:
 - 1. DuPont™ Tyvek® Wrap Caps, as manufactured by DuPont Building Innovations: #4 nails with large 1-inch plastic cap fasteners.
 - 2. Masonry tap-con fasteners with DuPont™ Tyvek® Wrap Caps as manufactured by DuPont Building Innovations: 2-inch diameter plastic cap fastener.

- C. Sealants
 - 1. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.
 - 2. Products: Sealants recommended by the weather barrier manufacturer.
- D. Adhesive:
 - 1. Provide adhesive recommended by weather barrier manufacturer.
- E. Primer:
 - 1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
- F. Flashing
 - 1. DuPont™ StraightFlash™, as manufactured by DuPont Building Innovations: straight flashing membrane materials for flashing sealing penetrations, at wall openings & penetrations, masonry ties, etc.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

- A. Install weather barrier over exterior face of all exterior wall sheathing substrates behind face brick, as shown on Drawings, in accordance with manufacturer recommendations.
- B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.
- D. Extend bottom roll edge over masonry interface 2" to 3" minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.

- E. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.
- F. Wall Openings: Extend weather barrier completely over openings.
- G. Weather Barrier Attachment:
 - 1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
- H. Apply 4 inch by 7-inch piece of DuPont™ StraightFlash™ to weather barrier membrane prior to the installation of cladding anchors.

3.3 SEAMING

- A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
- B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 PROTECTION

- A. Protect installed weather barrier from damage.

END OF SECTION 07250

SECTION 07920 – JOINT SEALANTSPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. Extent of joint sealer (denoted “sealant” or “caulking” on Drawings) is indicated on Drawings.
- B. This Section includes joint sealers for the following locations:
 - (1) Wall control joints “W.C.J.”
 - (2) Exterior and interior perimeters of all door frames, windows, louvers and other openings in interior and exterior walls.
 - (3) Top edge of roof counter flashings.
 - (4) Perimeter of all wall-hung plumbing fixtures.
 - (5) Below all exterior door thresholds.
 - (6) Around bottom of all exterior and interior hollow metal frames, at finish flooring termination against frame.
 - (7) All other locations as indicated or as required for providing watertight or aesthetic joints.
- D. Sealing joints related to Cast Stone is specified in a Division 4 Section 04720 “Architectural Cast Stone.” Cast Stone joint sealing shall be performed by Cast Stone Installer, using products and methods as specified in this section.
- E. Sealing joints at fire-rated construction is specified in Division 7 Section 07270 “Fire-stopping.”
- F. Sealing joints related to Roofing is specified in another Division 7 Section.
- G. Sealing joints related to Exterior Insulation and Finish System (E.I.F.S.) is specified in another Division 7 Section.
- H. Sealants for Glazing Purposes are specified in a Division 8 Section.
- I. Materials shall be delivered to the job site in new unbroken containers clearly labeled as to contents. Materials are to be stored at normal room temperature.
- J. Color cards of current available colors shall be submitted to Architect for selection of color.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sealant shall be equal to Sonneborn "NP-1", 1-part polyurethane, U.S. Government Spec. TT-S-00230, Type II, Class A. (Exterior locations).
- B. Interior Non-Fire-Rated Locations: Sealant shall be equal to Tremco Acrylic Latex 834 or equal/Dow "Performance Plus" Silicone Sealant.

2.02 Joint backing shall be as recommended by sealant manufacturer.

PART 3 – EXECUTION

3.01 APPLICATION

- A. Examine all joints to determine their acceptability for caulking and report discrepancies to the General Contractor.
- B. Clean all joints of foreign matter or loose particles; use compressed air as necessary. Insure that surfaces are dry.
- C. Joints up to 2" wide shall be 1/4"-3/8" deep. Joints over 2" wide shall have depth required. Force in sealant to fill entire joint and tool smooth. Use solvent as recommended by the sealant manufacturer for tooling.
- D. At completion of joint sealers, clean off all excess material from adjoining surfaces. Correct any damage caused by this work and leave work in watertight and neat condition.

END OF SECTION 07920

SECTION 073113 - ASPHALT SHINGLES

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. Asphalt shingles.
2. Underlayment.
3. Nail Over Ridge Vents.
4. Ventilating Nail-Base Insulation.

- B. Related Sections:

1. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, counter-flashings and flashings.

1.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles, ridge and eave vent indicated.

1. Include similar color charts of trim and accessories involving color selection.

- C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:

1. Asphalt Shingle: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: 12-inch- (300-mm-) long Sample.
4. Attic intake vent: 12-inch- (300-mm-) long Sample.
5. Self-Adhering Underlayment: 12 inches (300 mm) square.
6. Synthetic Underlayment: 12 inches (300 mm) square.

- D. Qualification Data: For qualified Installer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

- F. Research/Evaluation Reports: For each type of asphalt shingle required, from the ICC.
- G. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.
- H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. A single installer (Contractor) shall perform the roofing work of this project; and shall be a firm with not less than five (5) years experience in installation of Roofing System similar to that required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials. Contractor/installer/sub-contractor is to have been in business under the same name and organization for the past five (5) consecutive years with a successful experience record.
 - 2. Installer's Field Supervision: Installer to maintain a full-time supervisor/foreman on the job site during times that roofing work is in progress. Any roofing installed during times when the supervisor/foreman is not on site is subject to rejection.
 - a. Provide Field Supervisor's resume.
 - b. Field Supervisor must be experienced in installation of roofing systems similar to type and scope required for this project.
- B. Manufacturer: Company specializing in Asphalt Roofing Products with fifteen (15) years minimum experience. Being listed as pre-qualified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified.
 - 1. Shingle Roofing Standard: Comply with instruction and recommendations of shingle manufacturer, but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" and NRCA's "Steep Roofing Manual".
- C. Source Limitations: Obtain ridge and hip cap shingles ridge vents, felt underlayment and self-adhering sheet underlayment from single source from single manufacturer.
- D. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.
- E. Wind-Resistance Test Characteristics: Provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.
- F. FM Listing: Provide shingle roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift, and hail damage and are listed in "Factory Mutual Approval Guide" for Class 1 construction.

G. Pre-installation Roofing Conference: Prior to project start-up, a Pre-Roofing Conference will be held at the project site. Required attendees include the Owner, Architect/Consultant, Owner's insurer (if applicable), testing and inspection representative, roofing installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installer of roof accessories and equipment. **ATTENDANCE OF THE CONTRACTOR'S FOREMAN IS MANDATORY.** Review methods and procedures related to roofing system including but not limited to the following:

1. Review methods and procedures related to asphalt shingle roof installation, including manufacturer's written instructions.
2. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review structural loading limitations of deck during and after roofing.
5. Review flashings, special roof details, roof drainage, roof penetrations, exhaust fans, venting requirements and condition of other construction that will affect roofing system.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for shingle assembly during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weather-tight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- C. Provide traps or other means of protection from weather. Manufacturer's plastic wrapping is provided for protection during shipping only.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- B. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.
- C. Weather Conditions: Proceed with installation of shingles only with weather conditions are in compliance with manufacturer's recommendations and when substrate is dry.

1.8 WARRANTY

- A. The Warranties specified in this section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Warranty: Manufacturer's roof warranty for the replacement of asphalt shingles that fail in materials or workmanship within specified period.

1. Failures include, but are not limited to, the following:

- a. Manufacturing defects.
- b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.

2. Material Warranty Period:

- a. Architectural Shingles: Thirty (30) years from date of Substantial Completion, prorated, with first five years non-prorated. Manufacturer's Ten (10) Year 110 mph wind warranty. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor Ten (10) years from date of Substantial Completion.

- C. **Special Warranty Language: Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.**

- D. **Special Project Warranty:** General Contractor's State of Alabama Five (5) Year Roofing Guarantee covering the work of this Section. The Contractor is responsible for maintaining the roof in a water-tight condition, if leaks occur as a result of deterioration of materials or improper workmanship, for the following warranty period:

1. Warranty Period: Five (5) years from date of Substantial Completion.

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. Asphalt Shingles: 200 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Architectural Asphalt Shingles: ASTM D 3462, glass-fiber reinforced, mineral-granule surfaced, and self-sealing. UL Certification of ASTM D3462; Conforms to ASTM D3018 Type I – Self-Sealing; ASTM D3161-03b, Class "F" Wind Resistance (110-mph); ASTM D3161-99a, (110-mph) Wind Resistance; UL997 Wind Resistance, UL 2390/ASTM D6381 Class "H" and ASTM D7158 Class "H" Wind Resistance, and UL Class A Fire Resistance; heavy-duty glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; four-tab type, algae-resistant.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation – Landmark AR. (XT 30IR).
 - b. Owens Corning – TruDefinition Duration Storm. (Supreme Shingles).
 - c. GAF Materials Corporation – Timberline HD.
 2. Butt Edge Straight cut.
 3. Strip Size: Manufacturer's standard.
 4. Algae Resistance: Granules treated to resist algae discoloration.
 5. Color and Blends: As selected by Architect/Consultant from manufacturer's full range.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering Sheet Underlayment, Granular Surfaced: ASTM D 1970, minimum of 55-mil- (1.4-mm-) thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation – WinterGuard.
 - b. Owens Corning – WeatherLock Mat.
 - c. GAF Materials Corporation – StormGuard
- B. Synthetic Underlayment: Polyolefin based high strength reinforced roofing underlayment. ASTM D4869; Inorganic shingle underlayment standard ASTM D 6757. Fire resistance ASTM D 108, UL 790 Fire Resistant. UL classified as a Prepared Roofing Accessory.
1. Manufacturers:
 - a. CertainTeed – DiamondDeck.
 - b. Owens Corning – Deck Defense.
 - c. GAF Materials Corporation – DeckArmor.

2.3 SHINGLE-OVER RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and external deflector baffles; for use under ridge shingles.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Owens Corning – VentSure Rigid Roll Ridge Vent.
 - b. GAF Materials Corporation – Cobra Rigid Vent 2.
 - c. DCI Products, Smart Ridge II.
2. Minimum Net Free Area: **20NFVA, per lineal foot.**
 3. Width: 11-inch Minimum.
 4. Thickness: 1-inch.
- B. Attic Intake Fascia Ventilation: Intake vent shall be 1½-inch x 3-inch Cobra FasciaVent as manufactured by GAF or approved equal.

2.4 MISCELLANEOUS MATERIALS

- A. Ventilating Nail-Base insulation panel shall be a venting composite insulation board that consist of a 4'-0"x8'-0"panel of rigid polyisocyanurate insulation, a middle layer of solid wood spacers which allow lateral air movement through a **2-inch open air space and a Nailable surface of ¾-inch CDX plywood.**
1. Ventilating Nail-Base insulation panel shall have a total insulation thickness as required to provide a **minimum R-Value of 9.0.**
 - a. Manufacturers:
 - 1) Vented Nailboard by Johns Manville.
 - 2) Flintboard by Certainteed.
 - 3) Cool-Vent by Hunter
 2. Panel fasteners shall be manufacturer's fastener of appropriate length to penetrate the wood and/or metal deck substrate a minimum of 1-inch. Fasteners must be provided and/or approved by the venting nail-base manufacturer.

2.5 POLYISOCYANURATE ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- Flat Polyisocyanurate roof insulation board: thickness as indicated meeting ASTM C 1289, Type II, Class 2, Grade 2 (20 psi), felt or glass-fiber mat facer on both major surfaces.
- B. Manufacturers; subject to approval by the manufacturer of primary roofing materials shall be one of the following:
1. Atlas Corporation
 2. GAF Materials Corporation.
 3. Johns Manville, Inc.

2.6 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free of consistency required by roofing system manufacturer for application.
- B. Roofing Nails: Double hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, **ring-shank**, sharp-pointed, with a minimum ⅜-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate ¾-inch (19 mm) into solid wood decking or extend at least ⅛-inch (3 mm) through plywood sheathing.
1. Nails equal to the following:

- a. Maze # R103A, 1.5-inches, 11 gauge, $\frac{3}{8}$ -inch head
- 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Underlayment Nails: Hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.
- D. Ridge Shingles: Pre-cut manufacturer's ridge shingles applicable for wind warranty rating required under this Specification Section.
- E. Starter Shingles: Shall be located at the eaves and rakes or any other location where shingle roof begins. These shall be starter shingles as provided by the shingle manufacturer.

2.7 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
 - 1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches (125 mm) over and 4-inches (100 mm) beyond each side of down-slope asphalt shingles and 12 inches (300 mm) up the vertical surface.
 - 2. Step Flashings: Fabricate with a head-lap of 2 inches (50 mm) and a minimum extension of 4 inches (100 mm) over the underlying asphalt shingle and up the vertical surface.
 - 3. Cricket Backer Flashings: Fabricate with concealed flange extending a minimum of 24-inches (600 mm) beneath upslope asphalt shingles and 6 inches (150 mm) above the roof plane.
 - 4. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with 4-inch (50-mm) roof-deck flange and 1½-inch (38-mm) fascia flange with $\frac{3}{8}$ -inch (9.6-mm) hemmed drip at lower edge.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16-inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 6-inches (150 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which shingle work is to be performed and notify Architect/Consultant in writing of unsatisfactory conditions.
- B. Do not proceed with shingle work until unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBSTRATE

- A. Clean substrate of any projections and substances detrimental to shingle work. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with non-corrosive roofing nails.
 - 1. Remove and replace any damaged or deteriorated wood blocking, nailers, or fascia boards as drawings indicate.
- B. Verify that roof penetrations and plumbing stacks are in place and are securely fastened against movement.
- C. Verify roof openings are correctly framed prior to installing work of this Section.
- D. Verify deck surfaces are dry, free of ridges, warps, or voids.
- E. Review General and Specific Instructions noted on the Drawings.

3.3 VENTILATED NAILBASE INSULATING PANEL INSTALLATION

- A. Ventilated panels shall be placed with the long edge of the panel perpendicular to the slope of the roof in staggered rows and attached with an approved fasteners with minimum penetration of 1-inch into the wood and/or metal deck substrate below in a pattern as recommended by the manufacturer.

3.4 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2-inches (50 mm) over underlying course. Lap ends a minimum of 4-inches (100 mm). Stagger end laps between succeeding courses at least 72-inches (1830 mm). Fasten with capped roofing nails.
 - 1. Install synthetic underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of synthetic over self-adhering sheet underlayment not less than 3-inches (75 mm) in direction to shed water. Lap ends of felt not less than 6-inches (150 mm) over self-adhering sheet underlayment.
 - 2. Install fasteners at no more than 36-inch (900 mm) oc.
- C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and on Drawings, lapped in direction to shed water. Lap sides not less than 3-½inches (89 mm). Lap ends not less than 6-inches (150 mm) staggered 24-inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
 - 1. Eaves: Extend from edges of eaves 12-inches (300 mm) beyond interior face of exterior wall.
 - 2. Rakes: Extend from edges of rake 12-inches (300 mm) beyond interior face of exterior wall.
 - 3. Valleys: Extend from lowest to highest point 18-inches (450 mm) on each side.
 - 4. Hips: Extend 18-inches (450 mm) on each side.

5. Ridges: Extend 36-inches (914 mm) each side without obstructing continuous ridge vent slot.

3.5 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" and shingle manufacturer's written instruction.
 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Apron Flashings: Extend lower flange over and beyond each side of down-slope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a head-lap of 2-inches (50 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
 1. First course minimum 5-inches by 12-inches applied with the lowermost edge of the first shingle.
 2. Succeeding courses must consist of pieces that are a minimum 5-inches by 10-inches. Place each piece of flashing 2-inches up the roof from where the lowermost edge of the next (overlapping) shingle will be applied. Each succeeding course of flashing must "overlap" the flashing course below it a minimum of 2-inches.
- D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Closed-Valley Installation: Install valley shingle using closed-valley method; install in strict compliance with shingle roof system manufacturer's written specification guidelines.
- F. Rake Drip Edges: Install rake drip edge flashings **over** underlayment and fasten to roof deck.
- G. Eave Drip Edges: Install eave drip edge flashings **below** underlayment and fasten to roof sheathing.
- H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.
- I. Fabricate Pipe or Post Flashing: Assemble on-site as required with soldered seams and flange. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.6 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
 1. **Shingles must be applied with exposure specified by the shingle manufacturer, this is a requirement. Changing exposure will harm the appearance of the installed roof and reduce the ability to resist wind up-lift.**
 2. **Extend asphalt shingles 3/4-inch (19 mm) over fascia at eaves and rakes.**

3. Install manufacturer's starter strip along all eave and rake conditions.**4. Install manufacturer's pre-cut ridge shingles at all ridge conditions.**

- B. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- C. Fasten asphalt shingle strips with a minimum of **SIX roofing nails** located according to manufacturer's written instructions. **Hand nailing only, pneumatically driven fasteners will not be allowed.**
- D. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12-inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2-inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 - 1. Do not nail asphalt shingles within 6-inches (150 mm) of valley center.
 - 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.
- E. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- F. Ridge Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.7 CLEANING AND PROTECTION

- A. Protect existing roofing and installed products from foot traffic until completion of project.
- B. Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.
- C. Upon completion, remove any remaining debris from the roof and project site. Restore any damage to existing building surfaces and site caused by new work.

END OF SECTION 073113

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Formed roof-drainage sheet metal fabrications.
 - 2. Formed steep-slope roof sheet metal fabrications.
 - 3. Formed roof penetration flashings.
 - 4. Formed metal fascia fabrications
 - 5. Prefinished metal soffit and trim at Arcade

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.
 - 5. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 6. Document proceeding, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details.
 3. Include identification of material, 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, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include details of termination points and assemblies.
 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter-flashings as applicable.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
 12. Detail formed flashing and trim at scale of not less than 1½-inches per 12-inches.
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12-inches (300-mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12-inches (300-mm) long and in required profile. Include fasteners and other exposed accessories.
 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For fabricator.
 - B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - C. Sample Warranty: For special warranty.
- 1.7 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.
- 1.8 QUALITY ASSURANCE
- A. Fabricator Qualifications: Employ skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- C. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. 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 659-74.
 - c. Cracking, checking, peeling, or failure of paint to adhere to the bare substrate.
 - 2. **Finish Warranty Period: 20 years from date of Substantial Completion.**

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- D. Thermal Movements: Allow for thermal movements from 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. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum-Zinc alloy-coated steel sheet (Galvalume); produced according to ASTM Specification A792/A792M-97a "Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by Hot-Dip Process." Structural quality, AZ50 or 0.50 oz/sq. ft. (150 g/sq. m.) architectural Galvalume. Colors shall consist of 70% PVDF Kynar/Hylar. Manufacturer shall offer colors that provide reflectivity and emissivity standards, in accordance with Energy Star Ratings, DOE and LEED criteria. Colors shall provide for an SRI rating of minimum 29 @ slopes of 2:12 or greater. All colors shall be identified as LEED qualified and "COOL" colors to meet Energy Star compliance, 24 gauge.
 - 1. Color: As selected by Architect/Consultant from manufacturer's full range.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface, 0.015-inch thickness or as indicated.
 - 1. Finish: 2D dull, cold rolled.

2.3 SELF-ADHERING UNDERLAYMENT SHEET

- A. General: A self-adhering underlayment sheet consisting of a white engineered polyolefin composite film with factory-applied anti-skid coating surface and rubberized asphalt membrane with split-release film.
 - 1. Material: WIP 300HT High-Temperature Protection Self-Adhering Roofing Underlayment by Carlisle.

2.4 POLYVINYL CHLORIDE UNDERLAYMENT SHEET

- A. A 20-mil polyvinyl chloride sheet meeting ASTM D-822.ELASTOMERIC UNDERLAYMENT/SEPARATION SHEET

2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

- b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 - 3. Fasteners for Zinc-Coated (Galvanized) Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless.
 - 4. Fasteners for attachment of wood nailers and blocking: Series 300 Stainless steel screws.
- C. Solder:
- 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape ½-inch (13-mm) wide and ⅛-inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.6 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
- 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of ¼-inch in 20-feet (6-mm in 6-m) on slope and location lines indicated on Drawings and within ⅛-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
- 1. Use lapped expansion joint unless otherwise shown.

2. Form expansion joints of intermeshing hooked flanges, not less than 1-inch (25-mm) deep, filled with butyl sealant concealed within joints as indicated on the drawings.
- D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- E. Fabricate cleats and attachment devices from galvanized steel as indicated minimum 20-gauge.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use, rivet joints where necessary for strength.
- G. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch (2400-mm) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from 16 gauge galvanized steel. Fabricate expansion joints, expansion-joint covers and gutter accessories from same metal as gutters.
 1. Gutter Style: SMACNA designation for profile as shown on the drawings.
 2. Expansion Joints: Butt type with cover plate.
 3. Fabricate from the following materials:
 - a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 1. Fabricated Hanger Style: SMACNA figure designation as "32B".
 2. Fabricate from the following materials:
 - a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

2.8 ROOF SHEET METAL FABRICATIONS

- A. General: Any clarifications will be in accordance with National Roofing Contractors Association (NRCA) standards.
- B. Roof Edge Flashing: Fabricate in minimum 96-inch (2400mm) long, but not exceeding 12-foot (3.6-m) long sections.
 1. Joint style: Overlapped, 4-inches (100mm) wide.
 2. Fabricate from the following materials:
 - a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge.
- C. Counter-flashing: Fabricate from the following materials:
 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

- D. Expansion Joints: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- E. Rake Trim: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- F. Apron flashing: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- G. Step-flashing: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.
- H. Fascia/Frieze Cladding: Fabricate from the following materials:
 - 1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

2.9 PRE-FINISHED METAL SOFFIT SYSTEM

- A. 12" Full Ventilating Panel: Equal to Petersen, Pac-Clad, Pac-750 Soffit Panel; .032" thick aluminum; 1/2" panel depth, 6" o.c. "V" grooves.
- B. Trim Accessories: Pac-Clad Matching J-Channel Trim
- C. Finish: Kynar
- D. Color: As selected by Architect from manufacturer's full range of 36 stocked standard colors.
- E. Warranty: 30 yr. non-prorated finish warranty.

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 substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ELASTOMERIC UNDERLAYMENT/SEPARATION SHEET INSTALLATION

- A. Install underlayment as indicated on the drawings.

- B. Elastomeric Sheet Underlayment: Install underlayment, under sheet metal flashings and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2-inches.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Install continuous cleats spaced not more than 1-inch apart. Anchor each cleat with fasteners through the vertical leg face at 12-inches on center.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. 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 cited sheet metal standard.
 - 1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet of polyvinyl chloride (PVC) underlayment.
 - 2. Bed flanges in approved sealant where required for waterproof performance.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges not less than 1-inch deep, filled with elastomeric sealant concealed within the joints.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1¼-inches for wood screws
 - 1. Galvanized or Aluminum-Zinc Alloy-coated steel: Use stainless-steel fasteners
 - 2. Stainless Steel: Use stainless steel fasteners.
- 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 (25-mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70° F (4 and 21° C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4° C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1½-inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
 2. Do not pre-tin zinc-tin alloy-coated stainless steel
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, NRCA's "Roofing and Waterproofing Manual" and "SMACNA's Manual.". Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Counter-flashing: Coordinate installation of counter-flashing with installation of base flashing. Insert counter-flashing in reglets or receivers and fit tightly to base flashing. Extend counter-flashing 4-inches (100-mm) over base flashing. Lap counter-flashing joints minimum of 4-inches (100-mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant; interlocking folded seam or blind rivets and sealant as indicated.

3.5 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Loosely lock straps to front gutter bead and anchor to roof deck.
- C. Downspouts: Join sections with 1½-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60-inches (1500 mm) o.c.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system as indicated.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited SMACNA sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of ¼-inch in 20-feet (6-mm in 6-m) on slope and location lines indicated on Drawings and within ⅛-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On 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.
- 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 08110 – HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

- 1.01 WORK under this section comprises of furnishing and installing hollow metal frames for doors, windows and hollow metal doors and panels.
- 1.02 RELATED DOCUMENTS, drawings and general provisions of contract, General and Supplementary Conditions and Division 1 specifications sections apply to this section.
- 1.03 RELATED WORK, specified elsewhere that should be examined for its effect upon this section.
 - A. Section 08710 Finish Hardware
 - B. Section 09910 Painting
 - C. Section 04810 Unit Masonry
 - D. Section 09250 Gypsum Drywall
 - E. Section 08210 Flush Wood Doors
 - F. Section 06100 R&F Carpentry
 - G. Section 083990 Tornado Resistant Doors and Frames
- 1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:
 - A. ASTM-A366-95A - Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
 - B. ASTM-A568-95 -Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.
 - C. ASTM-A 569-91A - Specification for Steel, Carbon, (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
 - D. ASTM-A924-95 - General Requirements for Steel Sheet, Metallic coated by the Hot-Dip Process.
 - E. ASTM-A620- Specifications for Steel, Sheet, Carbon, Drawing Quality, Special Killed, Cold Rolled (for embossed panels).
 - F. ANSI A250.8-1998/SDI100 - Recommended specifications for standard steel doors and frames.
 - G. SDI-105-92 - Recommended Erection Instructions for Steel Frames.
 - H. ANSI/SDI A250.6 - 1997 - Hardware on Steel Doors (reinforcement-application).
 - I. ANSI-A250.4-1994 Test Procedure and acceptance criteria for physical endurance, steel doors and frames.

- J. ANSI-A224.1-1990 Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.
- K. ADA, The Americans with Disabilities Act - Title III - Public Accommodations
- L. ANSI-A117.1-1992 American National Standards Institute - Accessible and Usable Buildings and Facilities
- M. U.L. - 1784-90 Air leakage test of door assemblies.
- N. ASTM E283- 91 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- O. IBC- 2015

1.05 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations and sections, materials, gages and finishes, fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.
- B. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.
- C. Submit samples as necessary.

1.06 QUALITY ASSURANCE

- A. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition the distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who will be available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the total door and frame openings.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.
- B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and accepted by the Architect. Otherwise remove and replace damaged items.
- C. Store doors and frames at the building site in a dry, secure place.
 - 1. Place units on minimum 4 inches (101.6) high wood blocking.
 - 2. Avoid use of non-vented plastic or canvas shelters which could create a humidity chamber.
 - 3. If cardboard wrapper/packaging on door becomes wet, remove packaging materials immediately.
 - 4. Provide 1/4 inch (6.3) spaces between stacked doors to promote air circulation.

1.08 SEQUENCING AND SCHEDULING

- A. Deliver all doors and frames to the jobsite in a timely manner so not to delay progress of other trades.
- B. Issue purchase orders to frame, door and other hardware suppliers early so not to interfere with normal quoted delivery of materials.

1.09 **WARRANTY**

- A. Hollow metal doors and frames shall be supplied with a one (1) year warranty against defects in materials and workmanship.
- B. Warranty to commence with Architect's determination of substantial completion of the job.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS (providing the products supplied comply with this specification)

- A. STEELCRAFT
- B. CURRIES Co.
- C. CECO

2.02 MATERIALS

- A. Steel requirements, all doors and frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A-366 and A-568 general requirements or galvanealed to 'A-60' minimum coating weight standard per ASTM-A924. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A569.
- B. Coating Materials, primer, Use manufacturer's standard rust inhibiting primer conforming to ANSI-A-224.1-1990.
- C. Core Materials:
 - 1. Non-labeled doors or labeled doors, polystyrene foam core, self-extinguishing, non-toxic in case of fire.
 - 2. Fire labeled doors with temperature rise rating to have a mineral fiber core sufficient to obtain a 250 degree F (121 C) temperature rating.

2.03 FABRICATION

- A. General
 - 1. Fabricate all doors and frames in accordance with ANSI A250.8-1998/SDI-100 except where more stringent requirements are specified.
 - 2. Prepare doors to receive finish hardware per approved schedule. Include all thru-bolting holes as required per hardware template. not include unnecessary cutouts in door faces not required hardware template.
 - 3. Supply only doors and frames manufactured by one (1) of the acceptable manufacturers listed in this specification.

B. Doors

1. Classification: SDI Level 3 – Model 1.
2. Face Sheets: Minimum 16 ga. (0.053 inch) (1.3mm).
 - a. Cold or hot-rolled at interior locations.
 - b. Galvannealed A-60 at exterior locations.
3. All galvannealed doors at exterior locations to have galvannealed hardware reinforcements and channels.
4. Seams allowed only on edges of doors.
5. All vertical lock and hinge edges to be beveled 1/8 inch (3.2mm) in 2 inches (50.8mm). Non-beveled doors are not acceptable.
6. Doors to have continuous vertical mechanical interlocking joints at both lock and hinge edges with seams sealed internally by epoxy.
7. Top and bottom channels
 - a. Not less than 14 ga. (0.067 inch) (1.6mm) – inverted.
 - b. Weld channels securely to both face sheets. Gluing of face sheets to supporting door channels is not acceptable.
 - c. Close tops of outswinging exterior doors flush by the addition of steel top caps or channel fillers.
 - d. Bottom channel must be inverted. Provide weep holes in bottom channel to allow for escape of entrapped condensation moisture.
8. Closer reinforcements required in all doors scheduled for closers.
 - a. Reinforcements to be minimum 14 ga. (0.067 inch) (1.6mm).
 - b. Minimum of 20 inches (508mm) long.
 - c. Welded into door.
 - d. Galvannealed A-60 where door faces are specified as galvannealed.
9. Astragals: Where called for to be flat security type or “Z” as called for in drawings, specifications or by listing requirements.
10. All doors conform to ANSI-A250.4-1994 Level “A” criteria and be Tested to 1,000,000 operating cycles and 23 twist tests. Certification of Level “A” doors is to be submitted with approval drawings by the distributor. Do not bid or supply any type or gage door not having been tested and passed this criteria.

C. Frames

1. Construction: 16 ga. (0.053 inch) (1.3mm) hot or cold-rolled steel at interior locations, 14 ga. (0.067 inch) (1.6mm) galvannealed A-60 at exterior locations.
2. All galvannealed frames to have galvannealed hardware reinforcements only.
3. All exterior door frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area. All interior door frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area. KD type may be used where necessary to match existing and may be assembled at the jobsite. Fill all anchor point holes flush with adjacent surface, sand smooth and paint as specified.
4. Provide temporary shipping bars to help protect from damage during transmit and handling.
5. Temporary shipping bars to be removed before setting frames.
6. All welds on frames, transoms and sidelites to be flush with neatly mitered or butted material cutts.

D. Anchors

1. Wall anchors for attachment to masonry construction or drywall partitions
 - a. Use masonry, steel or wood stud anchors sized to accomodate frame jamb depth and face dimension on all welded frames.

2. All frame jamb anchors to be provided; one each jamb per 30 inches (762mm) of frame height or fraction thereof.
3. Floor anchors: Vertically adjustable
 - a. Floor anchors to be screw adjustable prior to permanent installation so as to provide the ability to plumb frame without the use of shims under jambs.
 - b. Fabricate anchors to receive 2 fasteners per jamb.
4. Head struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure.

E. Preparation For Hardware

1. Reinforcement: Reinforce components for hardware installation in accordance with SDI-107.
 - a. All lock and closer reinforcements in doors to be "box" or "channel" type.
 - b. All hinge reinforcements in doors to be 7 ga.
 - c. All hinge reinforcements in frames to be 7 ga. (0.167 inch) (4.2mm) securely welded to the frame rabbet.
2. Punch single leaf frames to receive three (3) silencers. Double leaf frames to receive one silencer per leaf at head. Factory install silencers prior to shipment to job site.
3. Factory prepared hardware locations to be in accordance with "Recommended locations for Builders' Hardware for Standard Steel Doors and Frames", as adopted by The Steel Door Institute.

PART 3 - EXECUTION

3.01 SETTING FRAMES

- A. Set all frames in accordance with SDI 105-92.
- B. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.
- C. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.
- D. Use temporary setting spreaders at all locations. Use intermediate spreaders to assure proper door clearances and header braces for grouted frames.
- E. Install all fire rated frames in accordance with requirements of NFPA-80-1999.
- F. Remove factory spreader bars used for shipping from frames before setting.

3.02 DOOR INSTALLATION

- A. Install hollow metal doors in frames using hardware specified in Section 08710 Finish Hardware.
- B. Clearances at edge of doors
 1. Between door and frame at head and jambs: 1/8 inch (3.2).

2. At meeting edges pairs of doors and at mullions: 1/8 inch (3.2).
3. At transom panels, without transom bars: 1/8 inch (3.2).
4. At sills without thresholds: 5/8 inch (15.9) maximum above finish floor.
5. At sills with thresholds: 1/8 inch (3.2) above threshold.

3.03 ADJUSTMENT AND CLEANING

- A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.
- B. Adjust moving parts for smooth operation. Use shims if necessary to allow for proper closing.
- C. Fill all dents, holes, etc. with metal filler and sand smooth and flush with adjacent surfaces - Reprime/paint to match finish.

END OF SECTION 08110

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefinished standard and fire rated type wood doors with flush faces.
2. Pre-fit and pre-machine pre-finished wood doors.

B. Related Sections:

1. Section 08110 - Hollow Metal Frames.
2. Section 08710 – Door Hardware.
3. Section 08800 - Glass and Glazing.
4. Section 268000 – Access Control System

1.2 REFERENCES

- A. WDMA - Window and Door Manufacturers Association: IS 1-A 1997 Industry Standard for Architectural Flush Wood Doors.
- B. NFPA-80 Standards for Fire Doors 1999 Edition.
- C. 2016 International Building Code or UL10c, Positive Pressure Fire Door Test Method.
- D. NFPA-105 Recommended Practice for Installation of Smoke-Control Door Assemblies, latest edition

1.3 SUBMITTALS

A. Shop Drawings and Product Data:

1. Submit in accordance with Section 01300.
2. Indicate general construction, jointing methods, hardware and louver locations, and locations of cut-outs for glass. Indicate thickness of veneers.

B. Samples:

1. Submit samples of wood veneer and factory finishing in accordance with WDMA Quality Standards I.S. 1-A 1997, sections G-18 and Guide Specifications 1.03 C.

C. Certification:

1. Submit certification that doors and frames comply with IBC 2009 or UL10c, Positive Pressure Fire Door Test Method.

1.4 QUALITY ASSURANCE

- A. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies in accordance with IBC 2009 or UL10c, Positive

Pressure Fire Door Test Method and which are labeled and listed for ratings indicated by ITS - Warnock Hersey, UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Doors: Comply with IBC-2015 or UL10c Category A.

B. WDMA I.S. 1-A 1997 Quality Standard: Window and Door Manufacturers Association Quality Standards for grade of door, core, construction, finish, and other requirements.

1.5 PRODUCT HANDLING

A. Plastic wrap and protect wood doors during transit, storage and handling to prevent damage, soiling or deterioration. Doors to be stored flat, off the floor with bottom door being supported every 24 inches in clean, dry surroundings. Protect from dirt, water and abuse.

B. Doors shall not be exposed to excessive moisture, heat, dryness, direct sunlight or where heating or air conditioning ducts will blow directly on them. Relative humidity should not be less than 30 % or greater than 60 %. Doors to be handled with clean or gloved hands so not to soil doors. Always keep doors in poly bag until they are ready to hang.

1.6 GUARANTEE/WARRANTY

A. **Guarantee:** Provide manufacturer's guarantee for all wood doors. Guarantee period: Lifetime of original installation. Doors exhibiting defects in materials or workmanship within guarantee period shall be replaced (including hanging and finishing) with new doors. These terms shall be part of the manufacturer's standard warranty.

PART 2 - PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

OSHKOSH
EGGERS Industries
ALGOMA Hardwoods

2.1 MATERIALS

A. Door Construction:

1. Non-Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;

- a. Core: bonded particle core (PC) conforming to WDMA I.S. 1-A 1997.
- b. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
- c. Stiles: Hardwood to match face veneer over structural composite lumber (SCL), glued to core.
- d. Rails: Mill option hardwood or SCL. Top and bottom: 2 inches before trim or factory fit.
- e. Facing: Wood veneer cut and specie as specified shall conform to WDMA I.S. 1-A 1997 "A" grade for Premium Grade Door Construction requirements.

2. Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;
 - a. Core: bonded mineral core (FD) conforming to WDMA I.S. 1-A 1997.
 - b. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
 - c. Stiles: Hardwood to match face veneer over mineral composite, glued to core.
 - d. Rails: Mineral composite as required by fire door authorities. Top and bottom: as required by manufacturer's fire door authorities.
 - e. Facing: Wood veneer cut and specie as specified shall conform to WDMA I.S. 1-A 1997 "A" grade for Premium Grade Door Construction requirements.

B. WOOD VENEER

1. Door face veneers shall meet quality standards conforming to WDMA I.S. 1-A 1997 "A" grade for transparent or semi-transparent finish. Minimum face veneer thickness shall be 1/50" at 12% moisture content after finish sanding
2. Species: White Birch
3. Face Cut: Rotary Cut
4. Face Assembly: Book Match
5. Face Symmetry: Running Match

C. ADHESIVES

1. Adhesives: Face to core adhesives shall be Type I or Type II as appropriate for location in building. Adhesives must be classified Type I or Type II per WDMA TM-6 "Adhesive Bond Test Method." Type I adhesives shall be used for doors in exterior applications, Type II adhesives shall be used for doors in interior applications.

D. CORE

1. Non-rated doors: Solid particleboard.
2. Fire-rated doors: Non-combustible mineral core containing no asbestos.

2.2 FACTORY FINISHING

1. Comply with referenced WDMA Section G-15, "Factory Finishing" for Premium Grade factory finish systems.
2. Pre-finish wood doors at factory.
3. Architect shall select color from manufacturer's standard colors.
4. Transparent Finish: Match finish indicated in WDMA Section G-17: WDMA System #6.
5. Doors shall be poly-bagged.

2.3 ACCESSORIES

A. Vision Frames:

1. Non-rated doors: Prefinished wood vision frames to match door veneer and finish.
2. Fire-rated doors: Metal vision frames.

3. Glass: Refer to Glazing Section for glass types.

2.4 FABRICATION

- A. Fabricate wood doors in accordance with requirements of WDMA I.S. 1-A 1997 Quality Standards.
- B. Fabricate fire rated doors in accordance with requirements of ITS - Warnock Hersey or Underwriters' Laboratories, with metal label on each door including IBC 2009 or UL-10c.
- C. Fabricate doors with WDMA Quality Standards hardware blocking options as follows:
 - 1. Provide HB-1 - head and HB-2 - sill rails and HB-4 – lock block on all doors.
 - 2. Provide HB-6 only when exit devices are specified for door.
- D. Provide doors with minimum ¼ inch thick edge strips, of wood species to match face veneers except as required for fire rating.
- E. Make cut-outs and provide stops for glass and louvers. Seal cut-outs prior to installation of moldings.
- F. Bevel lock and hinge edges of single acting doors 3 degrees or 1/8 inch in 2 inches.
- G. Prepare doors to receive hardware. Refer to Section 08710 - Hardware, NFPA 80 Latest Edition and UL10c Positive Pressure Fire Door Test Method for hardware requirements.
 - 1. Prefit and bevel to net opening size less approximately 1/4 inch in width on single swing doors. Provide 1/4-inch clearance above finished floor, unless otherwise indicated on drawings. Provide 1/8-inch clearance at top of door.
 - 2. Slightly ease vertical edges.

PART 3 - EXECUTION

3.0 EXAMINATION

- A. Examine installed door frames before hanging doors.
- B. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.1 INSTALLATION

- A. Handle doors in accordance with recommendations of WDMA I.S. 1-A, "Care and Installation at Job Site."
- B. Condition doors to average temperature and humidity in area of installation for not less than 48 hours prior to installation. Store doors per recommendations of WDMA I.S. 1-A, "Care and Installation at Job Site."
- C. Install in neat and skillful manner, free from hammer or tool marks, open joints or slivers.

- D. Set plumb, level, square and true. Install work after building humidity is at acceptable level.
- E. Remove and replace all doors found to be warped, twisted, bowed, or otherwise damaged. Do not install doors which cannot be properly fitted to frames.
- F. Adjust prefinished doors and hardware and other moving or operating parts to function smoothly and correctly.
- G. Ensure that smoke gaskets are in-place before prefinished door installation at fire-rated doors.

3.2 CLEANING / PROTECTION

- A. Clean prefinished doors and hardware.

END OF SECTION 08210

SECTION 08255 – FRP FLUSH DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory

1.2 SECTION INCLUDES

- A. Fiberglass reinforced polyester (FRP) flush doors, as shown and scheduled on the Drawings.

1.3 RELATED SECTIONS

- A. Division 8, Section 08110 "Hollow Metal Doors & Frames", for hollow metal frames to receive FRP Flush Doors.
- B. Division 8, Section 087100 "Finish Hardware".
- C. Division 8, Section 08800 "Glass and Glazing".
- D. Division 26, Section 268000 "Access Control System".

1.4 REFERENCES

- A. AAMA 1503-98 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- B. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing.
- C. ASTM B 117 - Operating Salt Spray (Fog) Apparatus.
- D. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- E. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
- G. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
- H. ASTM D 570 - Water Absorption of Plastics.
- I. ASTM D 638 - Tensile Properties of Plastics.
- J. ASTM D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- K. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
- L. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
- M. ASTM D 1623 - Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- N. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- O. ASTM D 2583 - Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- P. ASTM D 5420 - Impact Resistance of Flat Rigid Plastic Specimens by Means of a Falling Weight.
- Q. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.

- R. ASTM E 84 - Surface Burning Characteristics of Building Materials.
- S. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- T. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- U. ASTM F 476 - Security of Swinging Door Assemblies.
- V. NWWDA T.M. 7-90 – Cycle Slam Test Method
- W. SFBC PA 201 - Impact Test Procedures.
- X. SFBC PA 203 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.90 cfm per linear foot of perimeter crack.
- C. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
- D. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.
- E. Cycle Slam Test Method, NWWDA T.M. 7-90: Minimum 5,000,000 Cycles.
- F. Salt Spray, Exterior Doors and Frames, ASTM B 117: Minimum of 500 hours.
- G. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Minimum of 55 CRF value.
- H. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
 - 1. Flame Spread: Maximum of 200, Class C.
 - 2. Smoke Developed: Maximum of 450, Class C.
- I. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 15.0 foot-pounds per inch of notch.
- J. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 14,000 psi.
- K. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.
- L. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.
- M. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.
- N. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 5420: 120 in-lb.

- O. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.
- P. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.
- Q. Chemical Resistance, ASTM D 543. Excellent rating.
 - 1. Acetic acid, Concentrated.
 - 2. Ammonium Hydroxide, Concentrated.
 - 3. Citric Acid, 10%.
 - 4. Formaldehyde.
 - 5. Hydrochloric Acid, 10%
 - 6. Sodium hypochlorite, 4 to 6 percent solution.
- R. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.
- S. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.
- T. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.
- U. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.

1.6 SUBMITTALS

- A. Comply with Section 01300 - Submittals.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
- C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- D. Samples:
 - 1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
 - 2. Color: Submit manufacturer's samples of standard colors of doors and frames.
- E. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- F. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
- G. Warranty: Submit manufacturer's standard warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:

1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years successful experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.9 WARRANTY

- A. Warrant doors against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. **Warranty Period:** Ten years starting on date of shipment. In addition, a limited lifetime (while the door is in its specified application in its original installation) warranty covering: failure of corner joinery, core deterioration, delamination or bubbling of door skin.

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS

- A. For purpose of determining minimum performance and quality standards for FRP Flush Doors herein specified, the drawings and specifications are based upon products of the following manufacturer:
 1. Special-Lite, Inc., PO Box 6, Decatur, Michigan 49045. Toll Free (800) 821-6531. Website: www.special-lite.com. E-Mail: info@special-lite.com.
- C. This specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to submission in accordance with the Prior Approval section of these Specifications. Approval will be by written addendum only.

2.2 FRP FLUSH DOORS

- A. Model: Equal to Special-Lite **SL-17** Flush Doors with **SpecLite3** fiberglass reinforced polyester (FRP) face sheets.
- B. Door Opening Size: As indicated on the Drawings.
- C. Construction:
 1. Door Thickness: 1-3/4 inches.
 2. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is

produced from 100% reprocessed 6063-T5 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.

3. Corners: Mitered.
 4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
 5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
 6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
 7. Rail caps or other face sheet capture methods are not acceptable.
 8. Extrude top and bottom rail legs for interlocking continuous weather bar.
 9. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
 10. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
 11. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.
- D. Face Sheet:
1. Material: SpecLite3 FRP, 0.120-inch thickness, finish color throughout.
 2. Protective coating: Abuse-resistant engineered surface. Provide FRP with SpecLite3 protective coating, or equal.
 3. Texture: Pebble.
 4. Color: As selected by Architect from manufacturer's standard colors.
 5. Adhesion: The use of glue to bond face sheet to foam core is prohibited.
- E. Core:
1. Material: Poured-in-place polyurethane foam.
 2. Density: Minimum of 5 pounds per cubic foot.
 3. R-Value: Minimum of 9.
- F. Cutouts:
1. Manufacture doors with cutouts for required vision lites, louvers, and panels.
 2. Factory install vision lites, louvers, and panels.
- G. Hardware:
1. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
 2. Factory install hardware.

2.3 MATERIALS

- A. Aluminum Members:
1. Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T5 alloy recovered from industrial processes: ASTM B 221.
 2. Sheet and Plate: ASTM B 209.
 3. Alloy and Temper: As required by manufacturer for strength, corrosion resistance, application of required finish, and control of color.
- B. Fasteners:
1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.

2. Compatibility: Compatible with items to be fastened.
3. Exposed Fasteners: Screws with finish matching items to be fastened.

2.4 FABRICATION

- A. Sizes and Profiles: Required sizes for door units, and profile requirements shall be as indicated on the Drawings.
- B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.
- C. Assembly:
 1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
 2. Remove burrs from cut edges.
- D. Welding: Welding of doors or frames is not acceptable.
- E. Fit:
 1. Maintain continuity of line and accurate relation of planes and angles.
 2. Secure attachments and support at mechanical joints with hairline fit at contacting members.

2.5 HARDWARE

- A. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- B. Factory install hardware.
- C. Hardware Schedule: As specified in Section 087100.

2.6 VISION LITES

- A. Factory Glazing: Types as indicated on Glazing Schedules on the Drawings.
- B. Lites in Exterior Doors: Allow for thermal expansion.
- C. Rectangular Lites: As indicated on the Drawings.
 1. Factory glazed with screw-applied aluminum stops anodized to match perimeter door rails.

2.7 ALUMINUM FINISHES

- A. Anodized Finish: Class I finish, 0.7 mils thick.
 1. Clear 215 R1, AA-M10C12C22A41, Class I, 0.7 mils thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION AND INSTALLATION

- A. Ensure frames to receive FRP flush doors are plumb, level, square, and in tolerance.
- B. Install doors in accordance with manufacturer's instructions. Install doors plumb, level, square, true to line, and without warp or rack. Install exterior doors to be weathertight in closed position.
- C. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- D. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.
- F. Adjusting: Adjust doors, hinges, and locksets for smooth operation without binding.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.4 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions. Do not use harsh cleaning materials or methods that would damage finish.

END OF SECTION 08255

SECTION 08360 - SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glazed Aluminum Sectional Overhead Doors at Apparatus Room 129.
- B. Electric Operators and Controls.
- C. Operating Hardware, tracks, and supplemental supports at bottom chord of roof trusses (above drywall finish ceiling). Coordinate with truss installation.

1.02 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.
- B. Division 5 Sections "Metal Fabrications", Structural Steel Framing and "Light gauge Steel Trusses".
- C. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.
- D. Section 260533 - Raceway and Boxes for Electrical Systems: Empty conduit from control station to door operators.
- E. Section 262726 - Wiring Devices: Electrical service to door operators.

1.03 REFERENCES

- A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.04 DESIGN / PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with requirements of the *2016 International Building Code*.
- B. Wiring Connections: Requirements for electrical characteristics.
 - 1. 115 volts, single phase, 60 Hz.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weather-tight location.

1.08 PROJECT CONDITIONS

- A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. For purpose of determining minimum performance and quality standards, this specification is based upon products as manufactured by Overhead Door Corporation.
 - 1. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com
 - 2. Substitutions: Equal products by other manufacturers will be considered, subject to submission in accordance with the "Prior Approval" Section of these Specifications.

2.02 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

- A. Glazed Sectional Overhead Doors: **521 Series** Aluminum Doors by Overhead Door Corporation.
- B. Door Assembly: Stile and rail assembly secured with 1/4-inch (6 mm) diameter through rods.
 - 1. Panel Thickness: 1-3/4 inches (44 mm).
 - 2. Center Stile Width: 2-11/16 inches (68 mm)
 - 3. End Stile Width: 3-5/16 inches (84 mm)
 - 4. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
 - 5. Top Rail Width: 3-3/4 inches (95 mm).
 - 6. Bottom Rail Width: 4-1/2 inches (114 mm).
 - 7. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
 - 8. Stiles and Rails: 6063 - T6 aluminum.
 - 9. Springs: 10,000 cycles.
 - 10. Glazing: 1/8 inch (3 mm) Tempered glass.

- C. Finish and Color:
 - 1. Anodized Finish: Clear anodized.
- D. Windload Design: Provide to meet the Design/Performance requirements specified.
- E. Hardware: Galvanized steel hinges and fixtures with ball bearing rollers and hardened steel races.
- F. Lock: Interior galvanized single unit.
- G. Weather-stripping:
 - 1. Flexible bulb-type strip at bottom section.
 - 2. Flexible Jamb seals.
 - 3. Flexible Header seal.
- H. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
- I. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move doors in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
 - 1. Entrapment Protection: Required for momentary contact, includes radio control operation.
 - a. Photoelectric sensors monitored to meet UL 325/2010.
 - 2. Operator Controls:
 - a. Push-button operated control station for each door, with open, close, and stop buttons.
 - b. Master door control station located in Apparatus Room 129, with open, close and stop buttons for all doors.
 - c. Surface mounting: Interior locations at Apparatus Room 129.
 - 3. Special Operation: Radio control operation.
 - a. Provide flush-mounted master remote control station to operate all doors from Radio Room 111. Confirm final location prior to roughing.
 - b. Provide eight (8) hand-held RF transmitter devices, for remote operation use from Fire Department vehicles, as follows:
 - (1) Provide four (4) 2-button devices, each programmed to operate one front (east wall) door and its corresponding rear (west wall) door at each bay of Apparatus Room 129.
 - (2) Provide four (4) 4-button devices, each programmed to operate up to four doors at Apparatus Room 129; Program each device as directed by the Owner for specific doors to be operated by each device.
 - (3) Devices shall be clearly labeled to indicate door(s) operated by device. Exact label wording as provided by the Owner.
 - c. All door operators are to be equipped with Chamberlain myQ Smart Phone control or equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If 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 overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- C. Anchor assembly to wall construction and building framing without distortion or stress.
- D. Securely brace door tracks suspended from structure. Secure tracks to structural members only. Coordinate with installation of steel roof trusses.
- E. Fit and align door assembly including hardware.
- F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 CLEANING AND ADJUSTING

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.

3.05 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

3.06 OWNER TRAINING

- A. Instruct designated Owner's personnel in operation and maintenance requirements for doors.

END OF SECTION 08360

SECTION 08411 - ALUMINUM STORE FRONTS AND ENTRANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of aluminum entrances and storefronts complete with reinforcing, fasteners, anchors and attachment devices as indicated on drawings.
- B. Aluminum storefront entrances and frame types required for this project include:
 - (1) Exterior and interior entrance doors 100 and 112 and storefront frame types 1 and 2 at Vestibule 100, Exterior Entrance Door 112A and storefront frame type 1 and storefront window frame types 3, 4 and 5 as shown on plan and schedule.
 - (2) Accessories necessary to complete work, including matching prefinished formed aluminum sub-sills and sill flashings with concealed clip anchors, where indicated on drawings.
- C. Glazing: Refer to Glass and Glazing section of Division 8 for glazing requirements for aluminum entrances and windows.
- D. Door Hardware is specified under Division 8 - Finish Hardware and installed by Store Front supplier or manufacturer for doors in this section.
- E. Related Sections:
 - (1) Section 01400 - Quality Control
 - (2) Section 04810 - Unit Masonry
 - (3) Section 05500 - Metal Fabrications
 - (4) Section 07920 - Joint Sealants
 - (5) Section 08710 - Door Hardware
 - (6) Section 08800 - Glass and Glazing

1.03 REFERENCES

- A. Aluminum Association (AA):
 - (1) DAF-45 Designation System for Aluminum Finishes.
- B. American Architectural Manufacturers Association (AAMA):
 - (1) 503.1 Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Systems.
 - (2) 605.2-92 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - (3) 607.1 Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
 - (4) 608.1 Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.
 - (5) 701.2 Specifications for Pile Weatherstripping.
 - (6) SFM-1 Aluminum Storefront and Entrance Manual.

- C. American National Standards Institute (ANSI):
 - (1) A117.1 Safety Standards for the Handicapped.
- D. American Society for Testing and Materials (ASTM):
 - (1) A36 Structural Steel.
 - (2) B209 Aluminum and Aluminum-Alloy Sheet and Plate.
 - (3) B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
 - (4) B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
 - (5) C509 Cellular Elastomeric Pre-formed Gasket and Sealing Material
 - (6) C864 Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
 - (7) E283 Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
 - (8) E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
 - (9) E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- E. Federal Specifications (FS):
 - (1) TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.
- F. Steel Structures Painting Council (SSPC):
 - (1) Paint 12 Cold-applied Asphalt Mastic (Extra Thick Film).

1.04 SYSTEM REQUIREMENTS

- A. Design Requirements:
 - (1) Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
 - (2) Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
 - (3) Provide concealed fastening.
 - (4) Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
 - (5) Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
 - (6) Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
 - (7) Provide for expansion and contraction without detriment to appearance or performance.
 - (8) Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
 - (9) Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.
- B. Performance Requirements (Window Frames):
 - (1) Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot (0.0003 m3/sm2) of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf (300 Pa).

- (2) Water infiltration: No uncontrolled water penetration when tested in accordance with ASTM E331 at test pressure of 10.0 psf (480 Pa.).
- C. Thermal Requirements:
 - (1) Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 deg. F. (82 deg. Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
 - (2) Ensure doors function normally within limits of specified temperature range.
- D. Structural Requirements as measured in accordance with ANSI/ASTM E330:
 - (1) Wind loads for exterior assemblies:
 - (a) Basic loading:
 - (1) 35 psf acting inward
 - (2) 30 psf acting outward.
 - (2) Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/240 of its clear span.
- E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.05 SUBMITTALS

- A. General: Submit in accordance with Section 01300.
- B. Product Data:
 - (1) Submit manufacturer=s descriptive literature and product specifications.
 - (2) Include information for factory finishes, hardware, accessories and other required components.
 - (3) Include color charts for finish indicating manufacturer's standard colors available for selection.
- C. Shop Drawings:
 - (1) Submit shop drawings covering fabrication, installation and finish of specified systems.
 - (2) Include the following:
 - (a) Fully dimensioned plans and elevations with detail coordination keys.
 - (b) Locations of exposed fasteners and joints.
 - (3) Provide detailed drawings of:
 - (a) Composite members.
 - (b) Joint connections for framing systems and for entrance doors.
 - (c) Anchorage.
 - (d) System reinforcements.
 - (e) Expansion and contraction provisions.
 - (f) Glazing methods and accessories.
 - (g) Internal sealant requirements as recommended by sealant manufacturer.
 - (4) Schedule of finishes.
- D. Samples:
 - (1) Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.
 - (2) Where normal texture or color variations are expected, include additional samples illustrating range of variation.

- E. Test Reports:
 - (1) Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.
- F. Certificates:
 - (1) Submit manufacturer's certification stating that systems are in compliance with specified requirements.
- G. Qualification Data:
 - (1) Submit installer qualifications verifying years of experience.
 - (2) Include list of projects having similar scope of work identified by name, location, date. List reference name and phone number.
- H. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - (1) To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.
- B. Installer Qualifications: Certified in writing by Contractor as qualified for installation of specified systems.
- C. Perform work in accordance with AAMA SFM-1 and manufacturer's written instructions.
- D. Conform to requirements of ANSI A117.1 and local amendments.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Protect finished surfaces as necessary to prevent damage.
- B. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.
- C. Do not leave coating residue on any surfaces.
- D. Replace damaged units.

1.08 WARRANTY

- A. Provide written manufacturer's warranty, executed by company official, **warranting against defects in materials and products for 2 years from date of Substantial Completion. Warrant door corner construction for the life of the project.**
- B. Provide written installer's warranty, **warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 2 years from date of Substantial Completion.**
 - (1) Warranty shall cover following:
 - (a) Complete watertight and airtight system installation within specified tolerances.
 - (b) Completed installation will remain free from rattles, wind whistles and

- noise due to thermal and structural movement and wind pressure.
 - (c) System is structurally sound and free from distortion.
 - (d) Glass and glazing gaskets will not break or pop from frames due to design wind, expansion or contraction movement.
 - (e) Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.
- C. **Provide written warranty stating organic coating finish will be free from fading more than 10%, chalking, yellowing, peeling, cracking, pitting, corroding or non-uniformity of color, or gloss deterioration beyond manufacturer's descriptive standards for 5 years from date of Substantial Completion and agreeing to promptly correct defects.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

- A. The following specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by Kawneer, U.S. Aluminum, Tubelite, Trulite and other manufacturers will be considered subject to submission in accordance with the Prior Approval section of these specifications. Acceptance of approved substitutions will be by written Addendum only. No exceptions.
- B. **BASIS OF DESIGN – APPROVED MANUFACTURER AND SYSTEMS.** Subject to compliance with requirements indicated, provide products of the following:
- (1) Coral Aluminum Products, 3010 Rice Mine Road, Tuscaloosa, AL 35406.
- C. Substitutions:
- (1) General: Refer to Division 1 Section "Prior Approvals" for procedures and submission requirements.
 - (2) Pre-Contract (Bidding Period) Substitutions: Submit written requests in accordance with the Prior Approval section of these specifications.
 - (3) Substitution Documentation:
 - (a) Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
 - (b) Test Reports: Submit test reports verifying compliance with each test requirement for each aluminum storefront and entrance product required by the project.
 - (c) Product Sample and Finish: Submit product sample, representative of storefront for the project, with specified finish and color.
 - (4) Substitution Acceptance: Acceptance of approved substitutions will be by written Addendum only. No exceptions.
- D. Acceptable Entrance Doors:
- (1) Door Type "I":
 - (a) Equal to Coral Architectural Products, Series 500 Wide Stile Swing Doors, as indicated on drawings, with stops for insulating glass as shown.
- E. Acceptable Storefront Framing System:
- (1) Interior Door Frame Types "2" (with transom):
 - (a) Equal to Coral Architectural Products Storefront System FL200; 1 3/4"x4 1/2", for 1/4" thick glazing infill, as indicated on Drawings.
 - (2) Exterior Door Frame Type "1" (with transom) and Window Types "3", "4" and "5".
 - (a) Equal to Coral Architectural Products Thermal Storefront System FL300T;

2"x4½", for 1" thick glazing infill, as indicated on Drawings.

2.02 FRAMING MATERIALS AND ACCESSORIES

- A. Aluminum:
 - (1) ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.
- B. Interior Reinforcing:
 - (1) ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
 - (2) Shapes and sizes to suit installation.
 - (3) Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
- C. Anchorage Devices:
 - (1) Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
- D. Fasteners:
 - (1) Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
 - (2) Do not use exposed fasteners, except where unavoidable for application of hardware.
 - (3) For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
 - (4) For concealed locations, provide manufacturer's standard fasteners.
 - (5) Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
- E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.
- G. Glazing Gaskets:
 - (1) Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
 - (2) Conform to ASTM C509 or C864.
 - (3) Profile and hardness as required to maintain uniform pressure for watertight seal.
 - (4) Provide in manufacturer's standard black color.
- H. Weather-stripping:
 - (1) Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
 - (2) Provide EPDM or vinyl-blade gasket weather-stripping in bottom door rail, adjustable for contact with threshold.
- I. Internal Sealants: Types recommended by sealant manufacturer.
- J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

- K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.
- L. Thermal Barrier at Thermal Storefront System FL300T locations:
 - (1) Thermal Break consisting of ¼" interrupted separation filled with a two-part chemically curing, high-density polyurethane. Structural integrity is maintained by leaving a measured amount of the aluminum web creating a small integral structural Tab-Link™ and polyurethane adhesive bond.
 - (2) Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
- M. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - (1) Surface: Smooth, Flat.
 - (2) Exposed Coil-Coated Finish:
 - (a) Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent (70%) PVDF resin by weight in both color coat and clear topcoat. Prepare, pre-treat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - (b) Color: As selected by Architect from manufacturer's full range; to match aluminum storefront framing.
 - (3) Locations: Formed aluminum sill flashings and sub-sills, as indicated on Drawings at storefront frame sills.

2.03 GLASS AND GLAZING ACCESSORIES

- A. Refer to Division 8, Section 08800 Glass and Glazing.

2.04 FABRICATION

- A. Coordination of Fabrication:
 - (1) Check actual frame or window frame openings required in construction work by accurate field measurements before fabrication.
 - (2) Fabricate units to withstand loads which will be applied when system is in place.
- B. General:
 - (1) Conceal fasteners wherever possible.
 - (2) Reinforce work as necessary for performance requirements and for support to structure.
 - (3) Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators which will prevent contact and corrosion.
 - (4) Comply with Section 08800 for Glazing requirements.
- C. Aluminum Framing:
 - (1) Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
 - (2) Fabricate frame assemblies with joints straight and tight fitting.
 - (3) Reinforce internally with structural members as necessary to support design loads.
 - (4) Maintain accurate relation of planes and angles, with hairline fit of contacting members.
 - (5) Seal horizontals and direct moisture accumulation to exterior.
 - (6) Provide flashings and other materials used internally or externally that are

corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.

- (7) Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
- (8) Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
- (9) Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Entrance Doors:

- (1) Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
- (2) Provide extruded aluminum glazing stops of beveled and mitered design, with EPDM glazing gaskets, permanently anchored on security side and removable on opposite side.
- (3) Hardware:
 - (a) Receive hardware supplied in accordance with Section 08710 and install in accordance with requirements of this Section.
 - (b) Cut, reinforce, drill and tap frames and doors as required to receive hardware.
 - (c) Comply with hardware manufacturer's templates and instructions.
 - (d) Use concealed fasteners wherever possible.

E. Welding:

- (1) Comply with recommendations of the American Welding Society.
- (2) Use recommended electrodes and methods to avoid distortion and discoloration.
- (3) Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

F. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or oil-canning.

2.05 FINISH

A. Exterior Storefront and Entrance Frames:

- (1) Organic Coating (high performance fluoropolymer):
 - (a) Comply with requirements of AAMA 2605.
 - (b) Surfaces cleaned and given conversion coating pre-treatment prior to application of 0.3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.
 - (c) Finish coat of 70 percent minimum fluoropolymer resin fused to primed surfaces at temperature recommended by manufacturer, 1.0 mil (0.25 mm) minimum dry film thickness.
 - (d) Acceptable coating manufacturer's: PPG Industries Inc., and The Valspar Corporation.
 - (e) Provide in 2, 3, or 4 coat system as required for color selected.
 - (f) Manufacturer's standard colors as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions and proceed with work in accordance with Section 01400.
- B. Verify dimensions, tolerances and method of attachment with other Work.

3.02 INSTALLATION

- A. Erection Tolerances:
 - (1) Limit variations from plumb and level:
 - (a) 1/8 inch (3 mm) in 10 feet (3 M) vertically.
 - (b) 1/8 inch (3 mm) in 20 feet (6 M) horizontally.
 - (2) Limit variations from theoretical locations: 1/4-inch (6 mm) for any member at any location.
 - (3) Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than 1/4 inch (6 mm).
- B. Install doors and hardware in accordance with manufacturer's printed instructions.
- C. Set units plumb, level and true to line, without warp or rack of frame.
- D. Anchor securely in place, allowing for required movement, including expansion and contraction.
- E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.
- F. Seal perimeter members as shown on manufacturer's installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer's installation instructions. Use sealants as recommended by sealant manufacturer.
- G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 08800.
- H. Glazing: Refer to requirements of Section 08800. Utilize "anti-walk" edge blocking on all vertical edges of glazing.

3.03 ADJUSTING

- A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

3.04 CLEANING

- A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.
- B. Clean metal surfaces exercising care to avoid damage.

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
 - 1. Door hardware for steel (hollow metal) doors.
 - 2. Door hardware for aluminum doors.
 - 3. Door hardware for wood doors.
 - 4. Door hardware for other doors indicated.
 - 5. Keyed cylinders as indicated.
- B. Related Sections:
 - 1. Division 6: Rough Carpentry.
 - 2. Division 8: Aluminum Doors and Frames
 - 3. Division 8: Hollow Metal Doors and Frames.
 - 4. Division 8: Wood Doors.
 - 5. Division 26 Electrical
 - 6. Division 28: Electronic Security
- C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
 - 1. Builders Hardware Manufacturing Association (BHMA)
 - 2. NFPA 101 Life Safety Code
 - 3. NFPA 80 -Fire Doors and Windows
 - 4. ANSI-A156.xx- Various Performance Standards for Finish Hardware
 - 5. UL10C – Positive Pressure Fire Test of Door Assemblies
 - 6. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
 - 7. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
 - 8. ICC – International Building Code
- D. Intent of Hardware Groups
 - 1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
 - 2. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.
- E. Allowances
 - 1. Refer to Division 1 for allowance amount and procedures.
- F. Alternates
 - 1. Refer to Division 1 for Alternates and procedures.

1.2 SUBSTITUTIONS:

- A. Comply with Division 1.

1.3 SUBMITTALS:

- A. Comply with Division 1.
- B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.
- C. Product Data: Manufacturer's specifications and technical data including the following:
 - 1. Detailed specification of construction and fabrication.
 - 2. Manufacturer's installation instructions.
 - 3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
 - 4. Submit 6 copies of catalog cuts with hardware schedule.
 - 5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2
- D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.
 - 1. List groups and suffixes in proper sequence.
 - 2. Completely describe door and list architectural door number.
 - 3. Manufacturer, product name, and catalog number.
 - 4. Function, type, and style.
 - 5. Size and finish of each item.
 - 6. Mounting heights.
 - 7. Explanation of abbreviations and symbols used within schedule.
 - 8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.
- E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
 - 1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
- F. Samples: (If requested by the Architect)
 - 1. 1 sample of Lever and Rose/Escutcheon design, (pair).
 - 2. 3 samples of metal finishes
- G. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
 - 1. Operating and maintenance manuals: Submit 3 sets containing the following.
 - a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 - 2. Copy of final hardware schedule, edited to reflect, "As installed".

3. Copy of final keying schedule
4. As installed "Wiring Diagrams" for each piece of hardware connected to power, both low voltage and 110 volts.
5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.4 QUALITY ASSURANCE

A. Comply with Division 1.

1. Statement of qualification for distributor and installers.
2. Statement of compliance with regulatory requirements and single source responsibility.
3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
 - a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
 - b. Hardware Schedule shall be prepared and signed by an AHC.
4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
 - a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
 - b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

- B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.**

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Comply with Division 1.

1. Deliver products in original unopened packaging with legible manufacturer's identification.
2. Package hardware to prevent damage during transit and storage.
3. Mark hardware to correspond with "reviewed hardware schedule".
4. Deliver hardware to door and frame manufacturer upon request.

- B. Storage and Protection: Comply with manufacturer's recommendations.**

1.6 PROJECT CONDITIONS:

- A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.**
- B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.**

1.7 WARRANTY:

- A. Refer to Conditions of the Contract
- B. Manufacturer's Warranty:
 - 1. Closers: Ten years
 - 2. Exit Devices: Five Years
 - 3. Locksets & Cylinders: Three years
 - 4. All other Hardware: Two years.

1.8 OWNER'S INSTRUCTION:

- A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.9 MAINTENANCE:

- A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.
 - 1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
 - 2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
 - 3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.
- B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 1.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>
Hinges	Stanley	Bommer, McKinney
Continuous Hinges	National Guard Products	Stanley, ABH
Locksets	Best 45H, 9K Series	
Cylinders	Best 1E-74, 12E Series	
Exit Devices	Precision APEX 2000 Series	Von Duprin 98/99
Closers	Dorma 8900	LCN 4040XP
Access Control System	By Access Control Provider	
Push/Pull Plates	Trimco	Burns, Rockwood
Protection Plates	Trimco	Burns, Rockwood
Door Stops	Trimco	Burns, Rockwood
Flush Bolts	Trimco	ABH, Burns
Threshold & Gasketing	National Guard	Reese, K.N. Crowder

2.2 MATERIALS:

- A. Hinges: Shall be Five Knuckle Ball bearing hinges

1. Template screw hole locations
2. Bearings are to be fully hardened.
3. Bearing shell is to be consistent shape with barrel.
4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
5. Equip with easily seated, non-rising pins.
6. Non Removable Pin screws shall be slotted stainless steel screws.
7. Hinges shall be full polished, front, back and barrel.
8. Hinge pin is to be fully plated.
9. Bearing assembly is to be installed after plating.
10. Sufficient size to allow 180-degree swing of door
11. Furnish five knuckles with flush ball bearings
12. Provide hinge type as listed in schedule.
13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
15. UL10C listed for Fire rated doors.

B. Geared Continuous Hinges:

1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
2. Anti-spinning through fastener
3. UL10C listed for 3 hour Fire rating
4. Non-handed
5. Lifetime warranty
6. Provide Fire Pins for 3-hour fire ratings
7. Sufficient size to permit door to swing 180 degrees

C. Mortise Type Locks and Latches:

1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
10. Provide sufficient curved strike lip to protect door trim
11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable
12. Lock shall have self-aligning, thru-bolted trim
13. Levers to operate a roller bearing spindle hub mechanism
14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
15. Spindle to be designed to prevent forced entry from attacking of lever
16. Provide locksets with 7-pin removable and interchangeable core cylinders
17. Each lever to have independent spring mechanism controlling it
18. Core face must be the same finish as the lockset.

D. Cylindrical Type Locks and Latchsets:

1. Provide locksets tested and approved by BHMA/ANSI A156.2, Series 4000, Operational Grade 1, Extra-Heavy Duty.
2. Provide locksets listed by Underwriters Laboratories for use on fire rated single or double swinging doors.
3. Provide locksets that meet the design and operation of the cylindrical lock to meet the accessible requirements of ANSI A117.1 and ADA–Americans with Disabilities Act.
4. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.
5. Provide locksets that meet or exceed 50 Million cycle test verified by third party testing agency.
6. Provide locksets with the following mechanical features
 - a. Locksets outside locked lever must withstand minimum 1400 inch-pounds of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
 - b. Locksets shall fit modified ANSI A115.2 door preparation.
 - c. 2-3/4 inch (70 mm) backset, standard.
 - d. Door thickness – Available for 1 3/8" to 2 1/4" doors.
 - e. 9/16 inch (14 mm) throw latchbolt.
 - f. Latch to have single piece tail-piece construction.
 - g. Chassis – Critical latch and chassis components to be brass or corrosion-treated steel.
 - h. Lock shall allow the lever handle to move 45 degrees from parallel to the horizontal plane without engaging the latchbolt assembly.
 - i. Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
 - j. Locksets to have anti-rotational studs that are thru-bolted.
 - k. Provide sufficient curved strike lip to protect door trim at single doors. At pairs of doors, provide 7/8" Lip to Center Strike.
 - l. Each lever to have independent spring mechanism.
 - m. Lever springs to be contained in the main lock hub.
 - n. Outside lever sleeve to be seamless, of one-piece construction made of a hardened steel alloy.
 - o. Keyed lever to be removable only after core is removed, by authorized control key.
7. Locksets to have the capability of supporting manufacturers' conventional core as well as large and small interchangeable cores.
8. Provide core face with the same finish as the lockset.
9. Provide functions and design as indicated in the hardware groups.
10. Acceptable manufacturers and/or products:
 - a. dormakaba USA Inc. - Best 9K Series

E. Exit Devices:

1. Exit devices to meet or exceed BHMA for ANSI 156.3, Grade 1.
2. Exit devices to be 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.
3. Exit devices chassis to be investment cast steel, zinc dichromate.
4. Exit devices to have stainless steel deadlocking 3/4" through latch bolt.
5. Exit devices to be equipped with sound dampening on touchbar.
6. Non-fire rated exit devices to have cylinder dogging.
7. Non-fire rated exit devices to have 1/4" minimum turn hex key dogging.
8. Touchpad to be "T" style constructed of architectural metal with matching metal end caps.
9. Touchbar assembly on wide style exit devices to have a 1/4" clearance to allow for vision frames.
10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
11. Provide strikes as required by application.

12. Fire exit hardware to conform to UL10C and UBC 7-2. UL tested for Accident Hazard.
13. The strike is to be black powder coated finish.
14. Exit devices to have field reversible handing.
15. Provide heavy duty vandal resistant lever trim with heavy duty investment cast stainless steel components and extra strength shock absorbing overload springs. Lever shall not require resetting. Lever design to match locksets and latchsets.
16. Provide 9001-Quality Management and 14001-Environmental Management.
17. Vertical Latch Assemblies to have gravity operation, no springs.
18. Exit Device Intruder Function Visual Indicator is to be used in conjunction with the ANSI "10" Function, which allows the outside lever trim to be locked from the inside while the door remains closed. Rim cylinder on the exterior/trim side retracts the latch from the outside.
 - a. Indicator to be actuated by a rim cylinder equipped with a keyed core or thumb-turn.
 - b. Directional indicator feature shall have a large status indicator window with directional pointer embossed into the active case cover to indicate key turn direction to lock and unlock outside lever trim. Labels or stickers are not acceptable.
 - c. The status indicator window shall be integrated into the housing of the exit device and is to contain bright reflective material that may be seen in low light conditions.
 - d. Indicator window to be protected by impact resistant lens cover.
 - e. The action to lock down/unlock shall require a quarter turn (90°) of key or thumb turn.
 - 1) Locked status shall be indicated by a red indicator that will appear under the lens cover with an image of a locked padlock.
 - 2) Unlocked status shall be indicated by a green indicator that will appear under the lens of the cover with an image of an unlocked padlock.

F. Door Closers shall:

1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1½" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

G. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

H. Mop plates: Provide with four beveled edges ANSI J103, 4 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

I. Door Bolts: Flush bolts for wood or metal doors.

1. Manual flush bolts, Certified ANSI/BHMA 156.16 at openings where allowed local authority.
2. Provide Dust Proof Strike, Certified ANSI/BHMA 156.16 at doors with flush bolts without thresholds.

J. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

K. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.

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1. Weatherstrip shall be resilient seal of Silicone.
 2. UL10C Positive Pressure rated seal set when required.
- L. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
1. Door seal shall be resilient seal of Nylon Brush, Silicone.
 2. UL10C Positive Pressure rated seal set when required.
- M. Thresholds: Thresholds shall be aluminum beveled type with maximum height of ½" for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.
- N. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.
- 2.3 FINISH:
- A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
 - B. Powder coat door closers to match other hardware, unless otherwise noted.
 - C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.
- 2.4 KEYS AND KEYING:
- A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.
 - B. Cylinders, removable and interchangeable core system: Best CORMAX™ Patented 7-pin.
 - C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."
 - D. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.
 - E. Furnish keys in the following quantities:
 1. 1 each Grand Masterkeys
 2. 4 each Masterkeys
 3. 2 each Change keys each keyed core
 4. 15 each Construction masterkeys
 5. 1 each Control keys
 - F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.
 - G. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are

functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

- A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
 - 1. Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
 - 2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
 - 3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.3 INSTALLATION:

- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Conform to local governing agency security ordinance.
- C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
 - 1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.
- D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use "Riv-Nuts" or similar products.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

- A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
 - 1. Check and adjust closers to ensure proper operation.
 - 2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
 - a. Verify levers are free from binding.
 - b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.

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3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 SCHEDULE OF FINISH HARDWARE:

Manufacturer List

Code	Name
BE	Best Access Systems
BY	By Related Section
DM	Dorma Door Controls
NA	National Guard
PR	Precision
SECU	Securitech
ST	Stanley
TR	Trimco

Option List

Code	Description
36"	36" Door Width
3RO	Prefix option for 2000 Apex Series
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
BSHD	Blade Stop Spacer - Heavy Duty Arms
C	QUICK CONNECT WIRING OPTION
C4	CAM-STANDARD CAM
CA-03	Cylinder Attachment Kit (Rim/SVR Device)
CD	CYLINDER DOGGING
CSK	COUNTER SINKING OF KICK and MOP PLATES
DA	ADJUSTABLE DELAYED ACTION
EPT-Prep	EPT Prep
LD	Less Dogging
MLR	MOTORIZED LATCH RETRACTION
NFHD	Narrow Frame Bracket - Heavy Duty Arms
RQE	Request to Exit
TDS	TOUCHBAR MONITORING DOUBLE SWITCH
VIB	Double Visual Indicator Option

Finish List

Code	Description
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
AL	Aluminum
US26D	Chromium Plated, Dull

Hardware Sets

Set #01

Doors: 100

1	Continuous Hinge	HD1100A-LL 83"		NA
1	Exit Device-Storerm w/ Cyl Dog	3RO 2103 36" CA-03 CD	630	PR
1	Rim Cylinder-Exit Trim	12E-72 PATD	626	BE
1	Mortise Cylinder-Cyl Dogging	1E-74 PATD C4	626	BE
1	Door Pull-Exit Trim Pull	1191-4J	630	TR
1	Closer w/ Spring Stop	8916 S-DS BSHD DA	689	DM
NOTE: (Template Installation for 110 Degree Opening)				
1	Perimeter Gaskets	By Aluminum Door & Frame Provider		BY
1	Handicap Threshold	513 x LAR	AL	NA
1	Door Sweep	C627 A x LAR		NA

Set #02

Doors: 112

1	Continuous Hinge	HD1100A EPT x LAR		NA
1	Power Transfer	EPT-12C		PR
1	Elec Exit Device-Storeroom	3RO C MLR TDS 2103 36" CA-03	630	PR
1	Rim Cylinder-Exit Trim	12E-72 PATD	626	BE
1	Door Pull-Exit Trim Pull	1191-4J	630	TR
1	Closer w/ Spring Stop	8916 S-DS BSHD	630	DM
NOTE: (Template Installation for 110 Degree Opening)				
1	Door Sweep	200 NA x LAR		NA
1	Perimeter Gaskets	By Aluminum Door & Frame Provider		BY
1	Harness	WH-6E		ST
1	Harness	WH-32P		ST
1	Harness	WH-192P		ST
1	Power Supply-Exit Device	RPSMLR2BB		PR
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #03

Doors: 112A

1	Continuous Hinge	HD1100A EPT x LAR		NA
1	Power Transfer	EPT-12C		PR
1	Elec Exit Device-Storeroom	3RO C MLR TDS 2103 36" CA-03	630	PR
1	Rim Cylinder-Exit Trim	12E-72 PATD	626	BE
1	Door Pull-Exit Trim Pull	1191-4J	630	TR
1	Closer w/ Spring Stop	8916 S-DS BSHD	630	DM

Set #03

NOTE: (Template Installation for 110 Degree Opening)				
1	Door Sweep	C627 A x LAR		NA
1	Perimeter Gaskets	By Aluminum Door & Frame Provider		BY
1	Threshold	896 S x LAR	AL	NA
1	Harness	WH-6E		ST
1	Harness	WH-32P		ST
1	Harness	WH-192P		ST
1	Power Supply-Exit Device	RPSMLR2BB		PR
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #04

Doors: 129, 129A

1	Continuous Hinge	HD1100A EPT x LAR		NA
1	Power Transfer	EPT-12C		PR
1	Elec Exit Device-Storeroom	3RO C MLR TDS 2103 X 4903D 36"	630	PR
1	Rim Cylinder	12E-72 PATD	626	BE
1	Closer w/ Stop	8916 S-DS NFHD	689	DM
NOTE: (Template Installation for 90 Degree Opening)				
1	Door Sweep	C627 A x LAR		NA
1	Perimeter Gaskets	2525 C x LAR		NA
1	Threshold	896 S x LAR	AL	NA
1	Harness	WH-192P		ST
1	Harness	WH-32P		ST
1	Harness	WH-6E		ST
1	Power Supply-Exit Device	RPSMLR2BB		PR
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #05

Doors: 133

3	FEMA Hinges	By FEMA Door and Frame Manufacturer	630	BY
1	Power Transfer	EPT-12C		PR
NOTE: (FEMA Door and Frame manufacturer to prep for full mortise ETP-12C Power Transfer Device.)				
1	FEMA Elec Exit-Storeroom	AWLCH-TG1-D120-A7-NB	630	SECU
1	Mortise Cylinder	1E-74 PATD	626	BE
1	Closer w/ Stop	8916 S-DS NFHD	689	DM
NOTE: (Template Installation for 110 Degree Opening)				
1	Door Sweep	C627 A x LAR		NA
1	Perimeter Gaskets	2525 C x LAR		NA
1	Threshold	896 S x LAR	AL	NA
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #06

Doors: 133A

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Set #06

3 FEMA Hinges	By FEMA Door and Frame Manufacturer	630	BY
1 FEMA Multipoint Lock-Passage	5311E-F01M2-F-IHD-HVL	630	SECU
1 Closer w/ Stop	8916 IS	689	DM
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	200 NA x LAR		NA
1 Handicap Threshold	513 x LAR	AL	NA

Set #07

Doors: 129B

1 Continuous Hinge	HD1100 A x LAR		NA
1 Exit Device-Storeroom	3RO 2103 4903D LD x LAR	630	PR
1 Rim Cylinder	12E-72 PATD	626	BE
1 Closer w/ Stop	8916 S-DS NFHD	689	DM
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	C627 A x LAR		NA
1 Threshold	896 S x LAR	AL	NA

Set #08

Doors: 115

1 Continuous Hinge	HD1100 A x LAR		NA
1 Exit Device-Storeroom	3RO 2103 x 4903D CD x LAR	630	PR
1 Rim Cylinder-Exit Trim	12E-72 PATD	626	BE
1 Thumb Turn-Cyl Dogging	1EA-6A4 C4	626	BE
1 Closer w/ Stop	8916 S-DS NFHD	689	DM
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	C627 A x LAR		NA
1 Threshold	896 S x LAR	AL	NA

Set #09

Doors: 106

2 Continuous Hinge	HD1100 A x LAR		NA
2 Manual Flushbolt	3917-12	626	TR
1 Lockset-Storeroom w/ Deadbolt	45H-7TD14S PATD	626	BE
2 Closer w/ Stop & Hold	8916 S-DST NFHD	689	DM
2 Kick Plate	K0050 8" x 1" LDW B4E CSK	630	TR
1 Overlapping Astragal	By Hollow Metal Door Provider		BY
1 Perimeter Gaskets	2525 C x LAR		NA
2 Door Sweep	C627 A x LAR		NA
1 Drip Cap	16 A x +4" ODW		NA
1 Threshold	896HD S x LAR	AL	NA

Set #10

Doors: 122B

Set #10

1	Continuous Hinge	HD1100A EPT x LAR		NA
1	Power Transfer	EPT-12C		PR
1	Elec Exit Device-Storeroom	3RO TDS E2103 X V4908D 36" LD	630	PR
1	Rim Cylinder-Exit Trim	12E-72 PATD	626	BE
1	Closer w/ Stop	8916 S-DS NFHD	689	DM
1	Perimeter Gaskets	2525 C x LAR		NA
1	Door Sweep	200 NA x LAR		NA
1	Handicap Threshold	513 x LAR	AL	NA
1	Harness	WH-6E		ST
1	Harness	WH-32P		ST
1	Harness	WH-192P		ST
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #11

Doors: 122A

3	Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1	Exit Device-Passage Set	3RO 2114 X 4914D 36"	630	PR
1	Closer w/ Stop	8916 IS	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 6" x 1" LDW B4E CSK	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA
1	Door Sweep	200 NA x LAR		NA

Set #12

Doors: 122

3	Butt Hinge	FBF 168 4.5" x 4.5"	US26D	ST
1	Power Transfer	EPT-12C		PR
1	Elec Exit Device-Storeroom	3RO TDS E2103 X V4908D 36" LD	630	PR
1	Rim Cylinder-Exit Trim	12E-72 PATD	626	BE
1	Closer w/ Stop	8916 S-DS NFHD	689	DM
1	Perimeter Gaskets	2525 C x LAR		NA
1	Door Sweep	200 NA x LAR		NA
1	Harness	WH-6E		ST
1	Harness	WH-32P		ST
1	Harness	WH-192P		ST
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #13

Doors: 115A, 132

Fire Station No. 1
Southside, AL

Set #13

1	Continuous Hinge	HD1100A EPT x LAR		NA
1	Power Transfer	EPT-12C		PR
1	Elec Lockset-Storeroom	45HW-7DEU14S PATD RQE	626	BE
1	Closer w/ Stop	8916 IS	689	DM
1	Door Sweep	200 NA x LAR		NA
1	Handicap Threshold	513 x LAR	AL	NA
1	Harness	WH-6E		ST
1	Harness	WH-32P		ST
1	Harness	WH-192P		ST
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #14

Doors: 109

3	Butt Hinge	FBF168 4.5" x 4.5" NRP	US26D	ST
1	Power Transfer	EPT-12C		PR
1	Elec Lockset-Storeroom	9KW3-7DEU14D PATD RQE	626	BE
1	Closer w/ Stop	8916 DS NFHD	689	DM
1	Door Sweep	200 NA x LAR		NA
1	Harness	WH-6E		ST
1	Harness	WH-32P		ST
1	Harness	WH-192P		ST
1	Power Supply-Access Control	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Card Reader	By Access Control Provider		BY

Set #15

Doors: 101

3	Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1	Lockset-Classroom	9K3-7R14D PATD	626	BE
1	Closer w/ Stop & Hold	8916 DST	689	DM
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Perimeter Gaskets	2525 C x LAR		NA

Set #16

Doors: 116

3	Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1	Lockset-Classroom	9K3-7R14D PATD	626	BE
1	Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1	Wall Bumper	1270CV	626	TR
1	Perimeter Gaskets	2525 C x LAR		NA

Set #17

Doors: 110, 121, 128

3	Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1	Lockset-Storeroom	9K3-7D14D PATD	626	BE
1	Wall Bumper	1270CV	626	TR
1	Perimeter Gaskets	2525 C x LAR		NA

Fire Station No. 1
Southside, AL

Set #18

Doors: 103, 104, 105

3 Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1 Lockset-Office	9K3-7AB14D PATD	626	BE
1 Wall Bumper	1270CV	626	TR
1 Perimeter Gaskets	2525 C x LAR		NA

Set #19

Doors: 131

1 Continuous Hinge	HD1100 A x LAR		NA
1 Lockset-Office	9K3-7AB14D PATD	626	BE
1 Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1 Wall Bumper	1270CV	626	TR
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	200 NA x LAR		NA
1 Handicap Threshold	513 x LAR	AL	NA

Set #20

Doors: 111

3 Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1 Lockset-Office	9K3-7AB14D PATD	626	BE
1 Closer w/ Stop	8916 IS	689	DM
1 Wall Bumper	1270CV	626	TR
1 Perimeter Gaskets	2525 C x LAR		NA

Set #21

Doors: 107

3 Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1 Passage Set	9K3-0N14D	626	BE
1 Wall Bumper	1270CV	626	TR
1 Perimeter Gaskets	2525 C x LAR		NA

Set #22

Doors: 102

6 Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1 Manual Flushbolt	3916 12"	626	TR
1 Dust Proof Strike	3910N	626	TR
1 Passage Set	9K3-0N14D	626	BE
2 Wall Bumper	1270CV	626	TR

Set #23

Doors: 130

1 Continuous Hinge	HD1100 A x LAR		NA
1 Passage Set	45H-0N14S	626	BE
1 Closer w/ Stop & Hold	8916 DST	689	DM
1 Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
NOTE: (Mount Push Side)			
1 Kick Plate	K0050 8" x 1" LDW B4E CSK	630	TR
NOTE: (Mount Pull Side)			
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	200 NA x LAR		NA
1 Handicap Threshold	513 x LAR	AL	NA

Set #24

Doors: 108, 117, 118, 119, 120, 123, 124, 134

3 Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1 Privacy Set	9K3-0L14D	626	BE
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	200 NA x LAR		NA

Set #25

Doors: 113, 125, 126, 127

3 Butt Hinge	FBF168 4.5" x 4.5"	US26D	ST
1 Privacy Set	45H-0L14S VIB	626	BE
1 Kick Plate	K0050 8" x 2" LDW B4E CSK	630	TR
1 Mop Plate	KM050 6" x 1" LDW B4E CSK	630	TR
1 Coat Hook	3072	630	TR
1 Perimeter Gaskets	2525 C x LAR		NA
1 Door Sweep	200 NA x LAR		NA

Set #26

Doors: 129C, 129D, 129E, 129F, 129G, 129H, 129I, 129J

NOTE: All hardware device to hang, secure, close and gasket opening by Overhead Door provider.

Opening List

Opening	Hdw Set
129E	26
100	01
101	15
102	22
103	18
104	18
105	18
106	09
107	21
108	24
109	14
110	17
111	20
112	02
112A	03
113	25
115	08
115A	13
116	16
117	24
118	24
119	24
120	24
121	17
122B	10
122A	11
122	12
123	24
124	24
125	25
126	25
127	25
128	17
129	04
129A	04
129B	07
129C	26
129D	26
129F	26
129G	26
129H	26
129I	26
129J	26
130	23
131	19
132	13
133	05
133A	06
134	24

SECTION 08800 - GLASS AND GLAZING

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Extent of glass and glazing work is indicated on Drawings and Schedules.
- B. Types of work in this section include glass and glazing for:
 - (1) 1" th. Insulated Glazing for Exterior Entrance Doors, Sidelights, Transoms, Aluminum Storefront Windows and vision lights at FRP doors.
 - (2) ¼" th. Annealed and Tempered Glazing for Interior Aluminum Entrance Doors, Sidelights and Transoms and vision lights at interior wood doors.
- C. Related Sections:
 - (1) Exterior Aluminum Storefront Window Systems, Entrance Doors and Transoms are specified in Section 08411.
 - (2) Mirrors are specified in Division 10 Section 10801 "Toilet and Bath Accessories".

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in construction.

1.04 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material indicated.
- C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.
- D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
 - (1) Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass; provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Glazing Standards: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - (1) FGMA Publications: FGMA Glazing Manual
 - (2) SIGMA Publications: TM-3000 Vertical Glazing Guidelines
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
 - (1) *Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SCGG) or other certification agency acceptable to authorities having jurisdiction.*
- C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.
- D. Single-Source Responsibility for Glass: Obtain glass from one source for each type indicated below:
 - (1) Primary glass of each (ASTM C 1036) type and class indicated.
 - (2) Heat-treated glass of each (ASTM C 1048) condition indicated.
 - (3) Insulating glass of each construction indicated.
- E. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
 - (1) Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.08 **WARRANTY**

- A. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturers of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate within specified warranty period indicated below. Warranty only covers deterioration due to normal conditions of use and not to handling, installing,

protecting, and maintaining practices contrary to glass manufacturer's published instructions.

- (1) **Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in Product Data Sheets at end of this Section.

2.02 HEAT-TREATED FLOAT GLASS PRODUCTS, GENERAL

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. HEAT-TREATED FLOAT GLASS

- (1) Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality z3 (glazing select), kind as indicated below.
 - (a) Kind FT (fully tempered) where indicated.
- (2) Available Manufacturers: Subject to compliance with requirements, manufacturers offering heat-treated glass products that may be incorporated in the Work include, but are not limited to, the following companies.
AFG Industries, Inc.
Cardinal IG.
Saint-Gobain
Guardian Industries Corp.
HGP Industries
PPG Industries, Inc.
Viracon, Inc.

2.03 INSULATING GLASS PRODUCTS

- A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.
 - (1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulating glass products that may be incorporated in the Work include, but are not limited to, the following companies.
AFG Industries, Inc.
Cardinal IG.
Saint-Gobain
Guardian Industries Corp.
HGP Industries
PPG Industries, Inc.
Viracon, Inc.

- (2) For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
- (3) Provide heat-treated, clear float glass of kind indicated or, if not otherwise indicated, Kind FT (fully tempered) where safety glass is designated or required.

2.04 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - (1) Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 - (2) Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 - (3) Colors: Provide color of exposed joint sealants to comply with the following:
 - a. Provide selections made by Architect from manufacturer's full range of standard of colors for products of type indicated.
- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.
 - (1) Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.05 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
 - (1) AAMA 804.1.
 - (2) AAMA 806.1.
- B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.
- C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:
 - (1) Back-Bedding Mastic Glazing Tape Without Spacer Rod:
 - a. PTI 393 Glazing Tape (shimless), Protective Treatments, Inc.
 - b. S-M 5700 Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
 - c. Tremco 440 Tape, Tremco Inc.
 - d. Dyna-Seal, Pecora Corp.
 - e. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
 - f. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.

- g. SST-800 Tape, Tremco, Inc.
- (2) Back-Bedding Mastic Glazing Tape with Spacer Rod:
 - a. PTI 303 Glazing Tape (with shim). Protective Treatments, Inc.
 - b. Pre-shimmed Tremco 440 Tape, Tremco, Inc.
 - c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
- (3) Expanded Cellular Glazing Tape:
 - a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.06 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - (1) Neoprene, ASTM C 864.
 - (2) EPDM. ASTM C 864.
 - (3) Silicone, ASTM C 1115.
 - (4) Thermoplastic polyolefin rubber, ASTM C 1115.
- B. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
 - (1) Neoprene
 - (2) EPDM
 - (3) Silicone
 - (4) Thermoplastic polyolefin rubber.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.
 - (1) Preformed Gaskets:
 - Advanced Elastomer Systems, L.P.
 - Schnee-Morehead, Inc.
 - Tremco, Inc.

2.07 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

- F. Plastic Foam Joint Fillers: Pre-formed, compressible, resilient, non-staining, non-extruding, non-outgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.08 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Examine glass framing, with glazier present, for compliance with the following:
 - (1) Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 - (2) Presence and functioning of weep system.
 - (3) Minimum required face or edge clearances.
 - (4) Effective sealing between joints of glass-framing members.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.03 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass from edge damage during handling and installation as follows:
 - (1) Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
 - (2) Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

- E. Install elastomeric settings blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
 - (1) Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 - (2) Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- I. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

3.04 TAPE GLAZING

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sight line of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit opening s exactly, with stretch allowance during installation.
- B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weather-tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- C. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

- A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposes surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.07 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.08 PRODUCT DATA

- A. Primary (Clear) Float Glass Product Data

- (1) Primary (Clear) Float Glass Designation: See Schedule of Glazing Types
 - (2) Class: (Class 1 (clear) float glass.)

- B. Type "A" Insulating Glass Product Data

- (1) Insulating Glass Unit Designation: See Schedule of Glazing Types.
 - (2) Classification of Units: Class CBA per ASTM E 774.
 - (3) Air Space Width: Nominal ½" inch measured perpendicularly from surfaces of glass lites at unit's edge.
 - (4) Sealing System: Dual seal, primary and secondary sealants: (manufacturer's standard sealants).
 - (5) Spacer Specifications: Manufacturer's standard metal.

- a. Dessicant: Either molecular sieve or silica gel or blend of both.
- b. Corner Construction: Manufacturer's standard corner construction.
- (6) Glass Specifications: Comply with the following requirements.
 - a. Thickness of Each Lite: 6.0 mm (0.23 inch)
 - b. Uncoated Indoor Lite: Class 1 (clear) float glass. Kind FT (fully tempered), where scheduled. Condition A (uncoated), Class 1 (clear) float glass.
 - c. Outdoor Lite: TI-AC40 Low-E Coating: Where scheduled - Kind FT (fully tempered).

C. Elastomeric Glazing Sealant Product Data

- (1) Base Polymer: Urethane.
- (2) Type: S (single component).
- (3) Grade: NS (non-sag).
- (4) Uses Related to Exposure: T (traffic) and NT (non-traffic).

END OF SECTION 08800

Part 1 General

1.1 SECTION INCLUDES

- .1 Tornado resistant [fire rated] pressed steel frames.
- .2 Tornado resistant [fire rated] steel swing doors.
- .3 Door Hardware specified under schedule at the end of this section

1.2 RELATED SECTIONS

- .1 Section 04810 Unit Masonry: Masonry mortar fill of metal frames.
- .2 Section 07920 - Joint Sealing: Caulking between doors and adjacent construction.
- .3 Section 087100 - Door Hardware - General.
- .4 Section 09900 - Painting: Field painting of doors and frames.

1.3 REFERENCES

- .1 ASTM A36/A36M-05 - Standard Specification for Carbon Structural Steel.
- .2 ASTM A653/A653M-06 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- .4 ASTM E330-02 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .5 FEMA Standard 361 Design and Construction for Community Shelters on 'safe rooms' in homes in wind zones
- .6 Canadian Steel Door Manufacturers Association (CSDMA), Selection and Usage Guide for Steel Doors and Frames, 1990.
- .7 HMMA 802-92 - Manufacturing of Hollow Metal Doors and Frames.
- .8 HMMA 840-99 - Installation and Storage of Hollow Metal Doors and Frames.
- .9 NFPA 80-07 - Standard for Fire Doors and Other Opening Protectives.
- .10 UL10C-98 Standards for Positive Pressure Fire Tests of Door Assemblies.

1.4 PERFORMANCE REQUIREMENTS

- .1 Structural Performance:

- .1 Provide doors capable of withstanding a peak reflected pressure of 12.25 kPa (7psi) tested to ASTM E330 and FEMA 361 standards.
- .2 Rebound: 100%
- .3 Missile Impact Testing: 15-lb wood 2x4 traveling without pitch or yaw at 100 mph and striking perpendicular to the surface.
- .4 All items in assembly to conform to FEMA 361 and ICC 500 performance criteria.

1.5 REGULATORY REQUIREMENTS

- .1 Installed Door and Frame Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.6 SUBMITTALS

- .1 Section 01300: Submission procedures.
- .2 Product Data: Provide product data on door construction and hardware.
- .3 Shop Drawings: Indicate door and frame elevations, internal reinforcement, anchor types, closure methods, [finishes] location of cut-outs for hardware.
- .4 Test Data:
 - .1 Submit independent test data from a recognized licensed laboratory indicating compliance with the tornado resistance requirements.

1.7 QUALITY ASSURANCE

- .1 Perform Work to requirements of HMMA (Hollow Metal Manufacturers Association) standards.
- .2 Manufacturer: Minimum 5 years documented experience manufacturing tornado resistant door and frame assemblies.

1.8 DELIVERY, STORAGE AND PROTECTION

- .1 All products shall be handled and stacked off the ground so as to protect them against damage. They shall be protected from the weather while in transit and after delivery to the site. Store materials at temperature and humidity conditions recommended by manufacturers.
- .2 Comply with HMMA 840.
- .3 Weld minimum two temporary jamb spreaders per frame prior to shipment.
- .4 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage.
- .5 Store in vertical position, spaced with blocking to permit air circulation between components.

- .6 Store materials out of water and covered to protect from damage.
- .7 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

1.9 WARRANTY

- .1 Manufacturer's Limited Warranty: Five (5) years from date of supply, covering material and workmanship.

Part 2 Products

2.1 MANUFACTURERS

- .1 AMBICO Limited
1120 Cummings Avenue
Ottawa, Ontario, Canada K1J 7R8
Toll Free Phone 888-423-2224

Toll Free Fax 800-465-8561
- .2 Other Acceptable Manufacturers:
 - 1. Door Components – Fontana , CA
 - 2. Armortex – San Antonio, TX
- .3 Substitutions: Other manufacturers of similar products will be considered subject to submission of their product in accordance with the Prior Approval section of these Specifications. Approval will be by written Addendum only.

2.2 MATERIALS

- .1 Sheet Steel: Galvanized steel to ASTM A653/A653M.
 - .1 Coating designation [Z275] ([G90]) for exterior door assemblies.
 - .2 Coating designation [ZF001] ([A01]) for interior door assemblies.
- .2 Reinforcement [Channel]: To CSA G40.20/G40.21, coating designation to ASTM A653/A653M, [ZF75] ([A25]).
- .3 Structural Plate: Hot rolled steel to ASTM A1011.

2.3 ACCESSORIES

- .1 Hinges: Heavy weight butt type to be factory supplied.
- .2 Door Hardware: Specified in Hardware sets at the end of this Section.
- .3 Primer: Rust inhibitive zinc chromate.

- .4 Provide HVL Bottom Bolts that project horizontal and not into the floor to help resist with tripping and dust collection. **Bolts projecting into the floor will not be acceptable.**
- .5 Provide Hardware as required by Tornado and Frame Assembly Manufacturer. Provide a complete assembly under this section. Refer to hardware sets listed under schedule in this section.

2.4 FABRICATION

- .1 Manufacture doors and frames in accordance with FEMA 361 tested assemblies.
- .2 Steel Doors, Swing Type:
 - .1 Sheet steel faces, thickness, design, and core suitable to achieve specified tornado resistance.
 - .2 Tornado resistant construction, longitudinal edges [mechanically inter-locked] [welded, filled and sanded] with [no] visible edge seams.
 - .3 Top and Bottom Channels: Inverted, recessed, welded steel channels.
 - .4 Astragals: Metal astragals for double doors designed to conform with tornado resistant requirements.
 - .5 Weld structural steel channels flush to top and bottom of door.
 - .6 Weld hardware reinforcement plates in place.
- .3 Steel Frames: Swing Type
 - .1 Sheet steel and metal thickness appropriate to maintain tornado resistance.
 - .2 Factory assemble and weld frames.
 - .3 Mullions for Double Doors: Removable type.
 - .4 Provide and factory-install three single silencers for single doors and mullions of double doors on strike side, and two single silencers on frame head at double doors.
- .4 Affix permanent **metal** nameplates to door and frame, indicating manufacturer's name, door tag, model number, and performance rating.

2.5 FINISHES

- .1 Factory Finish: Factory applied zinc chromate primer to be applied to all exposed surfaces. Touch-up only permitted, where product has been welded and ground smooth.

Part 3 Execution

3.1 INSTALLATION

- .1 Install components including doors, frames, and hardware in accordance with manufacturer's written instructions.

- .2 Install doors and frames to [CSDMA] [HMMA 840] standards [and in accordance with NFPA 80, and local authority having jurisdiction].
- .3 Coordinate with masonry, gypsum board and concrete wall construction for anchor placement.
- .4 Set frames plumb, square, level and at correct elevation.
- .5 Allow for deflection to ensure that structural loads are not transmitted to frame.
- .6 Adjust operable parts for correct clearances and function.
- .7 Finish paint in accordance with Section 09 91 15.

3.2 ERECTION TOLERANCES

- .1 Installation tolerances of installed frame for squareness, alignment, twist and plumbness are to be no more than $\pm 1/16$ in (1.5mm) in compliance with HMMA 841.

3.3 FIELD QUALITY CONTROL

- .1 Provide qualified manufacturer's representative to instruct installers on the proper installation and adjustment of door assemblies.
- .2 Provide manufacturer's representative to inspect door installation, and test minimum ten (10) cycles of operation. Correct any deficient doors.

3.4 SCHEDULE

Tornado Resistant Schedule:

HW SET FEMA #1(Turn-out/Shelter)

Door: 102

Each to receive:

	3 ea	Hinges	GSH-918 Size	652	Gallery
	1 ea	FEMA 3-point lock	5314-F13-CVR-HVL	630	SEC
	1 ea	Cylinder	1E-74 or 12E-72 as req'd	626	BE
	1 ea	Closer	D4550 SN SEC	689	SD
	1 ea	Kick Plate	KO050 10" x 2" LDW B4E C-SUNK	SEC 630	
TR					
	1 ea	Wall Stop	1270CV TORX	626	
TR					
	1 st	Seal	5050 LAR		NA

END OF SECTION 083990

SECTION 09250 – GYPSUM DRYWALL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division – 1 General Requirements sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Types of work include:

- (1) Gypsum drywall.
- (2) Interior non-load bearing metal stud and furring systems.
- (3) Sound attenuation insulation.
- (4) Drywall finishing (joint tape and compound treatment).
- (5) Suspension and Framing Systems for interior flat drywall ceilings.
- (6) Tile backing panels at Shower Walls in Drywall Partitions

- B. Related Work specified in other sections:

- (1) Wood framing, blocking and trim are specified in Division 6 Sections.
- (2) Exterior Insulation and Finish System is specified in Division 7, Section 07240.
- (3) Blanket-type Thermal Building Insulation is specified in Division 7, Section 07210.
- (4) Porcelain wall tile is specified in Division 9 Section 09310 "Tile"
- (5) Division 15 Mechanical Sections.
- (6) Division 26 Electrical Sections.

1.03 QUALITY ASSURANCE

- A. Gypsum Board Standard: GA-216 by Gypsum Association.
- B. Metal Support Standard: ASTM C 754.
- C. Manufacturer: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.
- D. Allowable Tolerances: 1/8" offsets between planes of board faces and 1/4" in 8'-0" for plumb, level, warp and bow.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.05 PRODUCT HANDLING

- A. Deliver, identify, store and protect gypsum drywall materials to comply with referenced standards.

1.06 JOB CONDITIONS

- A. Environmental Conditions: Comply with referenced standards.

1.07 FIRE RESISTANCE RATINGS: As indicated by reference to design designations in UL Fire Resistance Directory, for types of assemblies in which drywall ceilings and partitions function as a fire protective membrane and tested per ASTM E119. Installation shall be in accordance with the UL Design being referenced.

1.08 COORDINATION OF WORK

- A. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, sprayed-on fireproofing and sprinklers.
- B. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties

PART II – PRODUCTS

2.01 METAL SUPPORT MATERIALS

A. Interior Wall/Partition Support Materials:

- (1) Drywall Studs: ASTM C645; 20 gauge unless otherwise indicated on Drawings.
- (a) Depth of Section: Generally, 3-5/8" deep (except where indicated on Drawings as 1-5/8" deep, 2-1/2" deep or 6" deep at Chase Walls, Column Furring, Wall Furring, Ceiling Framing and other locations) with 1-1/4" flange and flange return lip.
 - (b) Products as manufactured by Dietrich Metal Framing; a Worthington Industries Company; MarinoWare; a division of Ware Industries; Southeastern Stud & Components, Inc.; Unimast, Incorporated (USG), or equal.
 - (c) Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
 - (d) Stud system accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.
 - (e) Built-up Headers: Size, gauge and configuration as indicated on Drawings.
- (2) Furring Members ASTM C 645; 20-gauge, hat-shaped, 7/8" deep.

2.02 GYPSUM BOARD PRODUCTS

- A. Gypsum Board (GypBd): (Also known as gypsum wallboard). ASTM C630 with tapered long edges. Type "X" or Type "C" at fire rated partitions and ceilings only, if required by UL design referenced on Drawings.
- (1) Thickness 5/8"

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- (1) American Gypsum Co.
 - (2) G-P Gypsum
 - (3) LaFarge North America, Inc.
 - (4) National Gypsum Company
 - (5) Temple
 - (6) USG Corporation
- C. Type X:
- (1) Thickness: 5/8". Comply with GA-216 for each application and support spacing.
 - (2) Long Edges: Tapered
- D. Type C:
- (1) Thickness: 5/8". Comply with GA-216 for each application and support spacing, and with requirements for fire-resistance-rated assemblies if required by reference on drawings.
 - (2) Long Edges: Tapered
- C. Provide moisture resistant gypsum backing board at all locations where porcelain tile finish is scheduled over gypsum board.
- D. Thicknesses: As indicated above or, where not otherwise indicated, comply with thickness requirements of GA-216 for each application and support spacing. Comply with requirements for U.L. fire-resistance ratings indicated.
- E. Sheet Size: Maximum length available which will minimize joints.

2.03 TRIM ACCESSORIES

- A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim beads, U-type edge trim beads, special L-kerf-type edge trim beads, and one-piece control joint beads.

2.04 JOINT TREATMENT MATERIALS

- A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.
- B. Joint Tape: Interior Gypsum Wallboard: Paper.
- C. Joint Compound: On interior work provide chemical hardening type for bedding and filling, ready-mixed vinyl type or vinyl type powder type for topping.

2.05 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

- B. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.
- C. Gypsum Board Fasteners: Steel Drill Screws, complying with ASTM C1002, unless otherwise indicated.
 - (1) Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033" to 0.112" thick.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag, wool or rock wool; 3-1/2" unless indicated otherwise.
 - (1) Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly, where applicable.
 - (2) Provide Sound Attenuation Blankets at locations as indicated on Drawings at interior drywall partitions. SEE FLOOR PLAN LEGEND ON DRAWINGS.
- E. Gypsum Board Control Joints: Install gypsum board control joints at all door frames occurring in drywall partitions as indicated on the drawings.

PART III – EXECUTION

3.01 INSTALLATION OF METAL SUPPORT SYSTEMS

- A. Wall/Partition Support Systems:
 - (1) Install supplementary framing, blocking, furring and bracing at openings and terminations in the work; and at locations as required to support fixtures, equipment, services, heavy trim, casework, millwork, furnishings and similar work which cannot be adequately supported on gypsum board alone.
 - (2) Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
 - (3) Install runner tracks at floors, ceilings and structural walls, beams and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.
 - (4) Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support or substrate above the ceiling.
 - (5) Space studs and joists at 24" o.c. except as otherwise indicated.
 - (6) Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame; install runner track sections (for jack studs) at head and secure to jamb studs.
 - (a) Provide runner tracks of same gauge as jamb studs. Space jack studs same as partition studs.
 - (b) Install 20-gauge studs at each jamb for all doors 2'-8" wide to 4'-0" wide weighing not more than 200 lbs.; and for all doors less than 2'-8" wide weighing more than 100 lbs. Bit not more than 200 lbs.
 - (c) Install double 20-gauge studs placed back to back at each jamb for pairs of doors over 4'-0" wide weighing not more than 300 lbs.; screw attach web of back to back studs direct to jamb anchor clips nested between flange of stud.
 - (7) Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

- (8) Space furring members 24" o.c., except as otherwise indicated.

3.02 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

- A. Install sound attenuation blankets as indicated, prior to gypsum board unless readily installed after board has been installed on one side.
- B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate courses of board.
- C. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
- D. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1-1/6" open space between boards. Do not force into place.
- E. Locate either edge or end joints over supports except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that both tapered edge joints abut, and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- F. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
- G. Unless indicated otherwise, cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.) except in chase walls which are properly braced internally.
 - (1) Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
- H. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4" to 1/2" space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant. Do not fasten drywall directly to stud system runner tracks.
- I. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated, unless control or expansion joints are indicated, or unless fire rating is indicated.
- J. Where sound-rated drywall work is indicated (STC rating), including double-layer work and work on resilient furring, seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceiling.
- K. Space fasteners in gypsum boards in accordance with referenced standards, U.L. Design requirements, and with manufacturer's recommendations, unless otherwise indicated.

3.03 METHODS OF GYPSUM DRYWALL APPLICATION

- A. Single-layer and double layer application: Install exposed gypsum board as follows.
 - (1) On partitions/walls apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
- B. Single-layer and double layer fastening methods: Apply gypsum board to supports as follows:
 - (1) Fasten with screws.

3.04 INSTALLATION OF SUSPENSION SYSTEMS – GENERAL

- A. Install suspension system in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.
- B. To secure to metal clips, concrete inserts, steel bar joist, steel beam or steel deck, use power actuated fastener or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.
- C. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.
- D. Add additional wire as needed when using compatible clips and accessories.
- E. Control and Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction.
- F. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.
- G. Install cross tees at on center spacing as specified by the drywall manufacturer.
- H. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.
- I. For light fixtures use secondary framing cross tees as required to frame opening.
- J. Single cross tees in a route hole to be secured by 7/16" framing screw or alternative methods.

3.05. INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. General: Where feasible use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face

flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant filled (including expansion joints). Install where gypsum board abuts masonry.

- D. Install J-type semi-finishing trim where indicated and where exterior gypsum board edges are not covered by applied moldings.
- E. Install metal control joint (beaded-type) where indicated (G.C.J.).

3.06 INSTALLATION OF DRYWALL FINISHING

- A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, using type of compound recommended by manufacturer.
 - (1) Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
 - (2) Apply joint compound in 3 coats (not including prefill or openings in base) and sand between last 2 coats and after last coat.

3.07 ADJUST AND CLEAN

- A. Screw pop:
 - (1) Repair screw pop by installing new screw approximately 1-1/2" from pop and reseal.
 - (2) When face paper is punctured, install new screw approximately six months after installation or one heating season.
 - (3) Fill damaged surface with compound.
- B. Ridging:
 - (1) Do not repair ridging until condition has fully developed: Approximately six months after installation or one heating season.
 - (2) Sand ridges to reinforcing tape without cutting through tape.
 - (3) Fill concave areas on both sides of ridges with topping compound.
 - (4) After fill is dry, blend in topping compound over repaired area.
- C. Fill cracks with compound and finish smooth and flush.

3.08 PROTECTION OF WORK

- A. Installer shall advise Contractor of required procedures for protecting gypsum drywall work from damage and deterioration during remainder of construction period.

END OF SECTION 09250

SECTION 09310 – TILEPART 1 - GENERAL1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of tile work is indicated on drawings.
- B. Types of tile work in this section include the following:
 - (1) Interior Glazed Porcelain Floor, Base and Wall Tile, where indicated and scheduled on Drawings.
 - (2) Metal Transition Strips, where indicated on Drawings.
- C. Masonry Substrates are specified in Section 04810 Unit Masonry
- D. Gypsum drywall substrates and cementitious backer board substrates (for shower walls) are specified in Section 09250 "Gypsum Drywall".
- E. Acrylic Shower Pan Receptor (installed integrally with porcelain wall tile at shower) is specified in a Division 15 Section.

1.03 QUALITY ASSURANCE

- A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.04 SUBMITTALS

- A. Samples for Initial Selection Purposes: Submit manufacturer's stock color samples consisting of actual tiles, slabs or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection, where necessary.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.06 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

- C. Maintain temperatures at not less than 50 deg. F (10 deg. C) in tiles areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Porcelain Tile and Trim: The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by Dal-Tile and other manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications.
1. Available Manufacturer-Basis of Design: The following porcelain tile manufacturer and product has been accorded prior approval:

FLORIM USA – "Stonefire" Glazed Porcelain Tile

2.02 PRODUCTS, GENERAL

- A. ANSI Standard: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.
- (1) Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures and Patterns: For tile, grout, granite and other products requiring selection of colors, surface textures or other appearance characteristics, provide products as selected by Architect from manufacturer's standard color range, and as follows:
- (1) See Drawings for floor, base, wainscot and wall porcelain tile patterns.
- D. Slip-Resistance: Provide porcelain floor tiles with a coefficient of Friction (wet and dry value) of 0.6 or above, per recommendations of the Americans with Disabilities Act (ADA).

2.03 TILE PRODUCTS

- A. Porcelain Floor, Wainscot and Wall Tile: Provide flat tile complying with the following requirements:
- (1) Nominal Facial Dimension: 12" x 12" (refer to drawings for locations).
- (2) Nominal Thickness: 3/8" (10mm).
- (3) Product: Equal to FLORIM USA, "Stonefire"
- (4) Color by Architect
- B. Porcelain Tile Bullnose Cap Trim for Base and Wainscots, where shown on Drawings: Provide flat tile complying with the following requirements:

- (1) Nominal Facial Dimension: 3" x 12" (refer to drawings for locations).
- (2) Nominal Thickness: 3/8" (10mm).
- (3) Product: Equal to FLORIM USA "Stonefire"
- (4) Color by Architect.

2.04 CRACK SUPPRESSION MEMBRANE FOR THINSET TILE INSTALLATION

- A. Crack Suppression Membrane to be thin, cold applied, single component liquid and load bearing. Reinforcing fabric to be non-woven rot-proof specifically intended for crack suppression membrane. Materials to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured. Crack Suppression Membrane shall also meet the following physical requirements:

1. Elongation at break (ASTM D751): 20 - 30%
2. Service Temperatures (LIL 1016): -20 deg to 280 deg F (-28 deg to 137 deg. C)
3. Breaking Strength (ASTM D751): 1700 psi (11.7 MPa)
4. Thickness (LIL 1013): 20 mils (0.5 mm)
5. Service Rating (TCA/ASTM C627): Extra heavy/cycles 1-14

- B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

- (1) "Laticrete Blue 92" Anti-Fracture Membrane; Laticrete International, Inc.

2.05 SETTING MATERIALS

- A. Bond Coat: Dry-Set mortar or latex-portland cement mortar on cured bed; ANSI A108.5.
- B. Dry-Set Mortar: Provide product complying with ANSI A118.1.
- C. Latex-Portland Cement Mortar: Provide product complying with ANSI A118.4 and the following requirement for composition:
- (1) Prepackaged dry mortar mix incorporating dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
 - (2) Latex additive (water emulsion) of type described below, serving as a replacement for part or all of gauging water, added at job site to prepackaged dry mortar mix supplied or specified by latex manufacturer.
 - (a) Latex Type: Manufacturer's standard.

2.06 GROUTING MATERIALS

- A. Commercial Latex Portland Cement Grout: Provide product complying with ANSI A118..
- B. Chemical-Resistant Epoxy Grout at Porcelain Floor Tile in Kitchen A12 only: Provide product complying with ANSI A108.6

2.07 MISCELLANEOUS MATERIALS

- A. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred ST., Alexandria, VA 22134 or Ceramic Tile Institute, 700 N. Virgil Ave., Los Angeles, CA 90029.

- B. Primers: As recommended by tile manufacturer for types of substrate to receive tile.

2.08 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

2.09 MANUFACTURED COMPONENTS AND ACCESSORIES

- A. Tile Edge and Transition Strips: Roll-formed stainless steel transition strips; profile and height as indicated; with integral perforated anchoring leg for setting the strip into setting material.
1. Profile: Sloped transition strip; compliant with Americans with Disabilities Act (ADA).
 2. Height: As required to suit application.
 3. Material and Finish:
 - a. Brushed stainless steel: EGB
 4. Products:
 - a. Tile to Lower Finish: Schluter - RENO-U or RENO-TK.
- B. Tile Expansion and Control Joints for Thin-set Applications: Extruded rigid PVC profiles joined by a soft CPE movement joint material, with integral perforated anchoring legs for setting the joint into the setting bed.
1. Height: As required to suit application.
 2. Color: As selected by Architect from manufacturer=s standard range.
 3. Products: Schluter - DILEX.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.02 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
- B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic Tile Installation" (latest Edition); comply with TCNA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.
- C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners with disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in

items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

- E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.
- F. Expansion Joints: Locate expansion joints and other sealant filled joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.
 - (1) Locate joints in tile surfaces directly above joints in concrete substrates.
 - (2) Comply with expansion joint recommendations of current TCNA Handbook.
- G. Grout tile to comply with the requirements of the following installation standards:
 - (1) For porcelain grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts) comply with ANSI A108.10.

3.03 FLOOR INSTALLATION METHODS

- A. Thin-Set Porcelain Floor Tile: Install tile to comply with requirements indicated below for setting bed methods, TCNA installation methods related to types of subfloor construction and grout types:
 - (1) Latex-Portland Cement Mortar: ANSI A108.5.
 - (2) Substrate: Concrete Subfloors, Interior: TCNA F113, latest edition.
 - (3) Grout: Commercial latex portland cement, except epoxy grout at Kitchen A12 only.
 - (4) Install over crack suppression membrane.
- B. Thresholds and Transition Strips: Install thresholds and transition strips at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.
- C. Crack Suppression (Spot Treatment of Cracks):
 - (1) Crack suppression must be applied a minimum of 3 times the width of the tile or stone being installed or the tile being set over the crack must be completely over the crack suppression membrane. The tile over the crack cannot be in contact with the concrete. Install anti-fracture membrane in compliance with current revisions of ANSI A108.1 (A-1 through A-3). Review the installation and plan the application sequence. Pre-cut Anti-Fracture Membrane Reinforcing Fabric, allowing 2" (50 mm) for overlap at ends and sides. Roll-up the pieces for easy handling and placement. Shake or stir Anti-Fracture Membrane Liquid before using. Pre-treat all substrate cracks, cold joints, control joints, coves, corners and penetrations according to Manufacturer's specific recommendations. Allow pre-treated areas to dry to the touch. Apply a liberal coat of Anti-Fracture Membrane Liquid with brush or roller over substrate including pre-treated areas. Before the coat dries, unroll Anti-Fracture membrane Reinforcing Fabric, smooth out any wrinkles and press with brush or roller until Anti-Fracture Membrane Liquid Ableeds through to surface. Apply another liberal coat of Anti-Fracture Membrane Liquid and allow it to dry to the touch - 1-3 hours @ 70 deg. F (21 deg. C) & 50% RH. For installation of ceramic tile, mosaic, paver, brick or stone, follow **Thin Bed Method** (3.4 C.), which may begin as soon as last coat of Anti-Fracture Membrane Liquid has dried to the touch. Allow Anti-Fracture Membrane

to cure for at least 3 days @ 70 deg. F (21 deg. C) & 50% RH before exposing installation to rain or other water, even if covered by ceramic tile, mosaics, pavers, brick or stone.

3.04 THIN-SET BASE, WAINSCOT AND WALL TILE INSTALLATION METHODS

- A. Install types of tile designated for wall (wainscot) application to comply with requirements indicated below for setting bed methods, TCNA installation methods related to subsurface wall conditions, and grout types:
- B. Latex-Portland Cement Mortar: ANSI A108.5.
- C. Dry-Set Mortar: ANSI A108.5.
- D. Substrates:
 - (1) Gypsum Board, Interior: TCNA W243, latest edition.
 - (a) Grout: Commercial latex portland cement
 - (2) CMU Masonry, Interior: TCNA W202, latest edition.
 - (a) Grout: Commercial latex portland cement
 - (b) Grout-Shower Walls Only: Epoxy A118.3
 - (3) Cementitious Backer Units over Metal Studs, Interior: TCNA 244C-latest edition.
 - (a) Grout-Shower Walls Only: Epoxy A118.3

3.05 CLEANING AND PROTECTION

- A. Cleaning: Upon completion of placement and grouting, clean all tile and granite surfaces so they are free of foreign matter.
- B. Finish Tile Work: Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile or granite work.
- C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.
- D. Prohibit foot and wheel traffic when using tiled floors for at least 7 days after grouting is completed.
- E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09511 - LAY-IN CEILINGSPART 1 - GENERAL1.01 GENERAL

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

- A. Types of lay-in ceilings specified include the following:
- (1) Non-fire resistance rated lay-in ceilings:
 - a. Non-directional type, square-edge lay-in mineral fiber panel ceilings in exposed steel grid, as scheduled on Drawings.
 - b. Square-edge lay-in vinyl-faced gypsum board ceilings in exposed steel grid with "white" aluminum grid cap, as scheduled on Drawings.
 - B. Related Section: See Division 9 Section 09250 "Gypsum Drywall" for gypsum board ceilings and suspension systems where indicated on Drawings.
 - C. Related Section: See Electrical Drawings and Specifications for new light fixture locations, and fixture support requirements.
 - D. Related Section: See Mechanical Drawings and Specifications for grilles, registers and diffusers in lay-in ceilings.

1.03 SUBMITTALS

- A. Product data: Submit manufacturer's technical data for each type of lay-in ceiling unit and suspension system required.
- B. Samples: Submit manufacturer's standard size samples of acoustical units, but not less than 6" square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures and patterns available for each type of component required.
- C. Certificates: Submit certificates from testing laboratories attesting that acoustical ceiling products comply with specification requirements.

1.04 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Provide ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspection agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspection agency.
- (1) Surface Burning Characteristics: As follows, tested per ASTM E 84.

- (a) Flame spread: 25 or less.
- (b) Smoke developed: 50 or less.

1.05 SYSTEMS DESIGN CRITERIA

- A. Structural Criteria: Suspension system including all its components, hangers and fastening devices shall be capable of supporting lighting fixtures, ceiling grilles and lay-in units without deflecting more than 1/360 of span when tested as a simple beam-end free center reading.

1.06 COORDINATION OF WORK

- A. Coordinate layout and installation of ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components, and partition systems. Centerlines for ceiling system shall be established and maintained by Contractor. All trades shall work to these lines.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing ceiling units, permit them to reach room temperature and to have stabilized moisture content.
- C. Handle ceiling units carefully to avoid chipping edges or damaging units in any way.

1.08 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels. Lay-in ceiling units: Furnish quantity of full size units equal to 2.0% of amount installed.

1.09 GUARANTEE

- A. All materials and workmanship furnished under this section of the specifications shall be guaranteed in writing for a **period of ten (10) years from date of acceptance of the building** and any defective materials or workmanship shall be replaced during this period without cost to the Owner.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

- A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:
 - (1) Armstrong World Industries.
 - (2) BPB America Inc.
 - (3) USG Acoustical Products Co.

B. Acoustical Panels at Non-Fire-Resistance-Rated Ceilings:

- (1) To establish minimum design and quality standards, acoustical panels are non-directional type equal to **Armstrong Fine Fissured No. 1728 Humiguard Plus** (24" x 24" x 5/8").

(a) Color: White

C. Lay-in Vinyl Faced Gypsum Board Panels at Non-fire-resistance-rated Ceilings: To establish minimum design and quality standards, vinyl-faced gypsum board panels shall be equal to **SheetRock Brand ClimaPlus**, White, No. 3260, by USG, Inc. (24" x 24" x 1/2").

2.03 METAL SUSPENSION SYSTEMS, GENERAL

- A. Standard for metal suspension systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C-635 requirements.
- B. Finishes and colors: Provide manufacturer's standard factory-applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color indicated, or if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.
- C. Attachment devices: Size for 5 times design load indicated in ASTM C-635, Table 1, Direct Hung.
- (1) Hanger wire: Galvanized carbon steel wire, ASTM A-641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C-635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.
- D. Edge moldings and trim: Steel or Aluminum of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

2.04 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS

- A. Non-fire-resistance-rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from cold rolled steel sheet with 15/16" wide exposed faces on structural members; other characteristics as follows:
- (1) Material at lay-in acoustical ceilings: Double-web hot dipped galvanized steel.
- (2) Material at lay-in gypsum board ceilings: Double-web hot-dipped galvanized steel with aluminum cap.
- (3) Structural classification: Intermediate-duty system.
- (4) Finish: Painted, white.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
- (1) Manufacturers of Non-fire-resistance-rated Double Web Steel Suspension Systems:
- (a) Chicago Metallic Corporation
- (b) Armstrong World Industries, Inc. (Prelude XL)

(c) Donn, USG, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Measure each ceiling area and establish layout of lay-in units to balance border widths at opposite edges of each ceiling. Where possible, **avoid the use of less-than-half width units at borders unless shown otherwise. See Reflected Ceiling Plan on Drawings for layout and coordination/placement of electrical and mechanical elements.**

3.02 INSTALLATION

- A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and Cisca standards applicable to work.
- B. Arrange acoustical units as follows: Install tile in non-directional pattern.
- C. Install suspension systems to comply with ASTM C-635, with hangers supported only from building structural steel joists & beams, or from gypsum board fire ceiling & wood roof trusses. Locate hangers not less than 6" from each end and spaced 4'-0" o.c. each carrying channel or direct-hung runner unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".
- (1) Secure wire hangers by looping and wire-tying directly to structure or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
 - (2) Install hangers plumb and free from contact with insulation or others objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter-splaying or other equally effective means.
- D. Install edge moldings of type indicated at perimeter of ceiling areas and at locations where necessary to conceal edges of units.
- (1) Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with suspension system to tolerance of 1/8" in 12'-0". Miter corners neatly, accurately, and connect securely.
- E. Install panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe & cut panels to fit accurately at borders & penetrations.
- F. Frame around pipe supports and miscellaneous bracing. Main beams and cross tees shall be spaced to accommodate recessed light fixtures and ceiling grilles as shown on Electrical and Mechanical. Furnish and install extra beams and tees as required for installation of light fixtures. Support grid system at corners of all lay-in light fixtures and other ceiling-mounted items.
- (1) Ceiling contractor shall furnish and install grid tie-wire supports at corners of all recessed light fixtures. See Electrical for specific support requirements of all interior fixtures.

3.03 CLEANING

- A. Clean exposed surfaces of all lay-in ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09651 - RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of resilient flooring and accessories is shown and scheduled on drawings.
- B. Types of resilient flooring specified in this Section include:
 - (1) Type 1 and Type II Resilient Floor Tile
 - (2) Cove-type Rubber Base
 - (3) Reducer Strips.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of resilient flooring and accessories adhesives, sealants, and leveling compounds.
- B. Fire test Performance: Provide resilient flooring which complies with fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of resilient flooring and accessory.
- B. Samples for Initial Selection Purpose: Submit manufacturer's standard color charts in form of actual sections of resilient and patterns available, for each type of resilient flooring required.
- C. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.05 PROJECT CONDITIONS

- A. Maintain minimum temperature of 65 deg. F. (18 deg. C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently maintain minimum temperature of 55 deg. F (13 deg. C) in areas where work is completed.
- B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

1.06 EXTRA STOCK

- A. Furnish and deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.
- (1) Resilient Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

- (1) Manufacturers of Resilient Floor Tile (RFT):

Patcraft (**basis of specification**)

Contact: Todd Vickers, Account Manager
Mobile: 205-910-3710
todd.vickers@patcraft.com

Resilient Floor Tile (RFT) of the specified types by other manufacturers will be considered subject to submission of their product in accordance with the Prior Approval Section of these Specifications. All approved products will be identified by written Addendum. No verbal requests will be accepted and no verbal approvals will be given.

- (2) Manufacturers of Rubber Wall Base and Resilient Accessories:

Flexco
Johnson Rubber Co., Inc.
Mannington Commercial
Roppe Rubber Corp.

2.02 RESILIENT FLOORING COLORS

- A. Provide color as selected by Architect from manufacturer's standards.

- (1) Each type of RFT tile will be selected in one color.
- (a) Tile comprising each of the two types will be selected from manufacturer's standard colors in that group.

2.03 TILE FLOORING - GENERAL

- A. Resilient Floor Tile:

- (1) Type I RFT - Patcraft "Stratified+"
- (a) Construction: LVT
- (b) Style Name: "Stratified+"

- (c) Style Number: I322V (12"x24")
- (d) Wear Layer Thickness: 20 mil (.020"/.5mm)
- (e) Overall Thickness: .098 (2.5mm)
- (f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
- (g) Reference Specification: Class III printed film vinyl tile
- (h) ASTM F 1700: Type A Smooth
- (i) Finish: ExoGuard Quartz Enhanced Urethane

Locations: Vestibule 100, Lobby 112, Passage 112A, Kitchen 114, Dayroom/Dining 115.

(2) Type II RFT - Patcraft "Typography"

- (a) Construction: LVT
- (b) Style Name: "Charted", "Letterpress", "Typeface"
- (c) Style Number:
"Charted", I313V (24"x24"),
"Letterpress", I311V (24"x24"),
"Typeface", I312V (24"x24")
- (c) Wear Layer Thickness: 20 mil (.020"/.5mm)
- (d) Overall Thickness: .098 (2.5mm)
- (e) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
- (f) Reference Specification: Class III printed film vinyl tile
- (g) ASTM F 1700: Type A Smooth
- (h) Finish: ExoGuard Quartz Enhanced Urethane

Locations: All other areas scheduled to receive resilient tile not identified in Item (1) above.

2.04 ACCESSORIES

- A. Rubber Wall Base: Provide rubber base complying with FS SS-W-40, Type I, with matching end stops and preformed corner units, and as follows:
 - (1) Height: 4"
 - (2) Thickness: 1/8" gage.
 - (3) Color: As selected from manufacturer's standard colors.
 - (4) Style: Standard top-set cove.
 - (5) Finish: Matte.
- B. Reducer Strip: Equal to Roppe Style #22.
- C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions. All adhesives shall be asbestos-free.
- D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- E. Leveling and Patching Compounds: Latex types as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.
- B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.
- C. DO NOT allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.02 PREPARATION

- A. Prepare subfloor surfaces as follows:
 - (1) Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
 - (2) Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.
- B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.
- C. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION, GENERAL

- A. Install resilient flooring and/or accessories in patterns indicated on Drawings, using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.
- B. Scribe, cut, and fit resilient flooring and/or accessories to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.
- C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- D. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.
- E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.04 INSTALLATION OF ACCESSORIES

- A. Apply accessories to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed outside corner units and mitered or coped inside corners. Accessories shall be tightly bonded to substrate throughout length of each piece. Provide continuous contact at horizontal and vertical surfaces.
- (1) On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
- B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.05 CLEANING AND PROTECTION

- A. Perform following operations immediately upon completion of resilient flooring:
- (1) Sweep or vacuum floor thoroughly.
- (2) Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
- (3) Damp-mop floor being careful to remove black marks and excessive soil.
- (4) Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturer.
- B. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.
- C. Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer.

END OF SECTION 09651

SECTION 09900 – PAINTING & STAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SCOPE

- A. Provide all materials, labor, services and incidentals necessary for the completion of this section of the Work.
- B. Paint the work of all trades, including Divisions 15 and 26.
- C. Related work specified elsewhere:
 - (a) Shop prime coats of paint: Refer to other Sections.

1.03 SUBMITTALS

- A. Paint Materials List: Submit complete and detailed list of materials within 30 days after construction is started for Architect approval before ordering. Include the following information for each material to be used:
 - (1) Type of surface or use as stated in Painting Schedule herein.
 - (2) Type of material, description, application method.
 - (3) Brand name, exact identification.
 - (4) Manufacturer.
- B. Samples:
 - (1) Submit manufacturer's color charts in duplicate to the Architect within 30 days after the award of the contract with the Paint Materials List.
 - (2) Colors will be selected by the Architect and submitted to the Contractor in scheduled form. More than one color will be selected.
 - (3) Provide two samples of stained finish on hardwood, for each type specified, to Architect for approval prior to starting work. Samples shall be on specified wood and 12" x 12" in size.

1.04 ENVIRONMENTAL CONDITIONS

- A. Perform all exterior work during favorable weather conditions only and when temperature is 50 degrees F or above.
- B. Adequately ventilate all spaces to remove all moisture of construction from building to prevent mildew and improper drying of paint.
- C. Maintain constant temperature of 65 degrees F or above after painting has started. Avoid wide variations of temperature.

- D. Before painting has started in any area, broom clean and remove all direct dust.
- E. After painting is started, broom cleaning not allowed. Use commercial vacuum cleaning equipment only for cleaning.

1.05 PRODUCT DELIVER, STORAGE AND HANDLING

- A. Deliver materials to the Project Site in strong, undamaged, waterproof containers with manufacturer=s labels intact. Materials in previously opened or unsealed containers are not acceptable.
- B. Immediately upon delivery to the Project Site, store and lock all paint materials in an area within the building. Keep locked at all times except when materials are being prepared or removed for use on the Project.

PART 2 - PRODUCTS

2.01 GENERAL

- A. No materials will be allowed on the Project Site at any time during construction except those of the manufacturers specified or approved by the Architect.
- B. Mix all materials in and apply directly from containers in which they are purchased except when use of other containers is approved by the Architect.

2.03 QUALITY

- A. Certain manufacturer's products are specified herein to simplify description of types and qualities of finishes required. Only the highest quality materials are acceptable.
- B. Primers: As specified by manufacturer of finish paint used and as approved by the Architect.
- C. Turpentine: Conform to FS TT-T-801.
- D. Mineral Spirits: Conform to FS TT-T-291A, Grade 1.
- E. Linseed Oil: Conform to FS TT-L-190 (boiled).
- F. Shellac: Conform to FS TT-S-300 4 lb. cut.
- G. Thinners: As recommended by the manufacturer of the specified paint material.

2.04 MANUFACTURERS

Pittsburgh; PPG Industries, Inc.
Glidden
Benjamin-Moore

Sherwin Williams
Devoe
Pratt and Lambert

PART 3 - EXECUTION

3.01 GENERAL

- A. Examine all surfaces to see that they are in proper condition to be finished before proceeding with the work. Starting work will constitute the painter's acceptance of

preceding work and conditions under which finish will be applied and his assumption of responsibility for results to be obtained.

- B. Number of coats and quality of finish shall be in accordance with these specifications, which require the use of materials which will produce first quality finish if properly applied.
- C. Except as otherwise approved by the Architect, apply all paint by roller or brush application. Roller application not permitted for stain and transparent finishes.
- D. Protect the work of this section and work of others during progress against damage and promptly repair such damage such any occur. Cover factory finished members with heavy paper and masking tape. Do not allow masking tape to touch finished surfaces.
- E. Paint all exposed surfaces, whether or not colors are designated in any schedule, except where the natural finish of the material is obviously intended or a surface is specifically noted not to be painted.

3.02 PREPARATION OF SURFACES

A. General:

- (1) Clean all surfaces and protect from dampness.
- (2) Remove all foreign material which will adversely affect adhesion or appearance of applied coatings.
- (3) Remove all efflorescence from masonry to be painted.

B. Wood:

- (1) Touch up knots, resinous spots, etc., on both new and existing surfaces with WP 578 sealer 18 hours before applying prime coat of paint.
- (2) Sand to smooth surface and dust before priming.
- (3) Putty nail holes, cracks and blemishes after priming coat has dried. Fill nail holes flush. Concave filled holes not acceptable.
- (4) Match putty color to finish coat.

C. Metal:

- (1) Clean greasy or oily surfaces with turpentine or mineral spirits and wipe dry with clean cloths before applying any materials.
- (2) Remove rust and scale before painting and treat with rusticide.
- (3) Touch-up weld, cuts and scratches or scuffed marks with metal protective primer. (Primer shall match initial coat.) Fill all dents or scratches with spot putting DLF-40 by Ditzler Color Division and sand level and smooth before painting. Grind if necessary to remove shoulders.
- (4) Clean all galvanized metal surfaces with proprietary cleaner designed for this purpose, used in accordance with their manufacturer's directions before applying the first coat of paint.

- D. Cementitious Materials: Prepare cementitious surfaces of concrete, cementitious (cement fiber) panels/trim and concrete block to be painted by removing efflorescence, chalk, dirt, dust, grease and oils. Do not paint over surface where alkalinity or moisture content exceeds that permitted in manufacturer's printed directions.

E. Drywall:

- (1) Fill all irregularities with patching material and sand to smooth level surface.
- (2) When sanding, avoid raising nap of paper.

3.03 APPLICATION

- A. Allow exterior paints to dry 72 hours between coats and interior paints to dry 24 hours between coats. Allow additional time until finish is dry if necessary.
- B. Finish tops, edges, bottoms of all doors same as faces. Remove door if necessary.
- C. Only the best workmanship is acceptable. All material shall be spread and smoothly flowed on without run, streaks, sags, brush marks, unfinished patches or other blemishes.
- D. Remove all finish hardware prior to finishing doors.
- E. Apply coats of material in strict accordance with manufacturer's current published specifications except where requirements of these specifications are in excess of manufacturer's requirements.
- F. Sand lightly between coats at no additional cost when undercoats, stains or other conditions show through the final coat until paint film is of uniform finish, color and appearance.
- G. Paint interior surfaces of ducts visible through registers, grilles with flat, non-specular black paint.
- H. Paint back side of all access panels, hinged covers to match exposed surfaces.

3.04 CLEAN-UP

- A. Clean all paint spots from all work and touch up or otherwise repair any defective or damaged work.
- B. Remove all surplus materials and equipment after work is completed, except leave excess paint with Owner for future touch-up work.
- C. Leave entire job clean and acceptable to Architect.
- D. Perform all "touch-up" work necessary after other mechanics have finished their work.

3.05 SCHEDULE OF FINISHES

- A. General: The following specification for finishing is not intended to mention every particular item which will receive painter's finish, but it is intended to establish type and quality of finish which will be required on various materials.
- B. EXTERIOR PAINT SCHEDULE:
 - (1) General: Provide the following paint systems for the various substrates indicated
 - (2) Ferrous materials:

1st Coat: B50NZ6 Kemkronik Universal Metal Primer, or equal.
2nd Coat: semi-gloss alkyd enamel (TT-E-529, Class A).
3rd Coat: semi-gloss alkyd enamel (TT-E-529, Class A).
First coat not required on items delivered shop primed.

Extent: Hollow Metal Doors and Frames, Steel channel jambs at O.H. doors, Steel pipe bollards, Steel Lintel Angles and any other exposed ferrous metal items.

- (3) Plumbing Roof Vents as follows:
(a) Primer (where required): Zinc dust zinc oxide primer (TT-P-641) on zinc-coated metal.
First coat: Semi-gloss alkyd enamel (TT-E-529).
Second coat: Semi-gloss alkyd enamel (TT-E-529).
- (4) Zinc Coated Metal:
1st and 2nd Coat: B50WZ30 Galvite HS Primer, or equal.
3rd Coat: Semi-gloss enamel (TT-E-509)
Not less than 2.5 mils dry film thickness.

C. INTERIOR PAINT SCHEDULE:

- (1) General: Provide the following paint systems for the various substrates indicated.
- (2) Zinc Coated Metal:
1st and 2nd Coat: B50WZ30 Galvite HS Primer, or equal.
3rd Coat: semi-gloss enamel (TT-E-509).
Not less than 2.5 mils dry film thickness.
Extent: Electrical panel board conduit covers, exposed conduits in finish areas.
- (3) Ferrous Metals
Extent:
(a) Hollow Metal Doors and Frames;

1st Coat: Enamel undercoater (TT-E-543). Touch-up shop primer as required.
2nd Coat: Semi-gloss enamel (TT-E-509).
3rd Coat: Semi-gloss enamel (TT-E-509).
No less than 2.5 mils dry film thickness.
First coat not required on items delivered shop primed.
- (4) Gypsum Drywall Systems with Eggshell Enamel:
(a) Odorless Eggshell Latex Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.
(b) Primer: White, interior, latex-based primer.
Devoe - 50801 Wonder-Tones latex Primer and Sealer.
Glidden - 5019 PVA Primer.
Moore - Moore's Latex Quick-Dry Prime Seal #201
PPG - 6-2 Quick-Dry Latex Primer Sealer.
S-W - Prep Rite 200 Latex Wall Primer.

- (5) Gypsum Drywall Ceiling Systems with Eggshell Finish:
- (a) Odorless Eggshell Latex Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.
 - (b) Primer: White, interior, latex-based primer.
Devoe - 50801 Wonder-Tones latex Primer and Sealer.
Glidden - 5019 PVA Primer.
Moore - Moore's Latex Quick-Dry Prime Seal #201
PPG - 6-2 Quick-Dry Latex Primer Sealer.
S-W - Prep Rite 200 Latex Wall Primer.
 - (c) First and Second Coats: Interior latex eggshell enamel.
Devoe - 34XX Wonder-Tones Interior Latex Eggshell enamel.
Moore - Regal AquaVelvet 319.
S-W - Pro XP Interior Latex Eggshell (B20-3200 Series).
- (6) Concrete Masonry Units:
- (a) Semi-gloss Alkyd Enamel Finish: 2 coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.
Block Filler: High-performance Latex Block Filler.
Undercoat: Interior Enamel Undercoat (FS TT-E-543)
Finish Coat: Interior Semi-gloss Odorless Alkyd Enamel (FS TT-E-509).
- (7) Concrete or Concrete Masonry Units with Epoxy Paint:
- (a) Gloss Epoxy-Polyamide Coating System: 2 coats over filled surface with total dry film thickness not less than 8.0 mils, excluding filler coat.
Block Filler: Heavy-duty Latex Block Filler with minimum dry-film thickness not less than 15.0 mils.
First and Second Coats: Sherwin-Williams Tile-Clad High Solids or approved equal.
- (8) Woodwork - Painted:
- (a) Semi-gloss Enamel Finish: 3 coats.
Undercoat: Interior Enamel Undercoat (FS TT-E-543).
1st and 2nd Coats: Interior Semi-gloss Odorless Alkyd Enamel (FS TT-E-509).
 - (b) Extent of Painted Woodwork: Plywood Backboards at Electrical Equipment.

3.06 FIRE RATED WALL IDENTIFICATION SIGNS

- A. Paint fire wall identification signs with red enamel paint, using stencils or templates as follows:
- B. All One Hour fire-rated walls and partitions shall be permanently identified on both sides of the wall (where applicable), above the ceiling line, with wording as follows:

FIRE BARRIER - PROTECT ALL OPENINGS

- (1) Such identification shall consist of 2" high red letters painted directly on the wall. Use red enamel paint. Spacing shall be 10'-0" o.c. maximum.
- (2) See Floor Plans on Drawings for locations of fire-rated walls and partitions.

END OF SECTION 09900

SECTION 10350 - FLAGPOLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes:
 - (1) One (1) New Ground-set, fixed, cone tapered Flagpole at location shown on Civil Drawings:
 - (a) Aluminum
 - (b) Exposed Height: 40'

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data and installation instructions for each type of flagpole required.
- C. Shop Drawings of flagpoles and bases, showing general layout, jointing, grounding method, and anchoring and supporting systems.
 - (1) Include details of foundation system for ground-set poles.
- D. Samples of each finished metal for flagpoles and accessories as requested by Architect.

1.04 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases, and anchorage devices.
- B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90-mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.
- C. Pole Construction: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with heavy Kraft paper or other weather-tight wrapping and prepare for shipment in hard fiber tube or other protective container.
- B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
1. AFB/Division of Pole-Tech Co., Inc.
 2. American Flagpole.
 3. Concord Industries, Inc.
 4. Ewing International Corp.

2.02 FLAGPOLE TYPE

- A. Aluminum Flagpole: Fabricate from seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, having a minimum wall thickness of 3/16 inch (0.1875 inch), tensile strength not less than 30,000 psi, and a yield point of 25,000 psi. Heat-treat and age-harden after fabrication.
- (1) Provide cone-tapered aluminum flagpoles.

2.03 FLAGPOLE MOUNTING

- A. Provide manufacturer's standard base system for the type of flagpole installation required.
- B. Foundation Tube for Flagpole: For ground-set flagpoles, provide 16-gage minimum galvanized corrugated steel tube, or 12-gage rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.
- (1) Provide manufacturer's standard flash collar, finished to match flagpole.

2.04 SHAFT FINISH

- A. General: Comply with NAAMM A Metal Finishes Manual for recommendations relative to application and designations of finishes.
- B. Aluminum: Finish designations prefixed by "AA" conform to the Aluminum Association system for designating aluminum finishes. Provide fine, directional, medium satin polish (AA-M32), finished as follows:
- (1) Buff complying with AA-M20 and seal aluminum surfaces with clear, hard coat wax.

2.05 FITTINGS

- A. Finial Ball: Manufacturer's standard flush-seam ball, size to match pole butt diameter.
- (1) 14-gage aluminum with flush seam.

- B. Truck: Stainless-steel ball-bearing, non-fouling, revolving, double-track assembly of cast metal finished to match pole shaft.
- C. Cleats: Two 9-inch cast metal cleats with fasteners, finished to match pole shaft, attached with stainless steel screws.
- D. Halyards: Provide two continuous halyards for each flagpole, as follows:
 - (1) Polypropylene, braided, white.
 - (2) Size: 5/16 inch (No. 10).
- E. Halyard Flag Snaps: Provide two swivel snaps per halyard, as follows:
 - (1) Chromium-plated bronze.

PART 3 - EXECUTION

3.01 PREPARATION FOR GROUND-SET POLES

- A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish, and other foreign matter from excavation; and moisten earth before placing concrete. Back fill open excavation after concreting with original excavated material.
- B. Concrete: Provide concrete composed of portland cement, coarse and fine aggregate, and water mixed in proportions to attain 28-day compressive strength of not less than 3000 psi, complying with ASTM C 94.
- C. Place concrete immediately after mixing. Compact concrete in place by use of vibrators. Moist-cure exposed concrete for not less than 7 days, or use a non-staining curing compound in cold weather.
- D. Finish trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base perimeter.

3.02 FLAGPOLE INSTALLATION

- A. General: Prepare and install new flagpole at location shown on Civil Drawings and in compliance with accepted shop drawings and manufacturer's instructions.
 - (1) Provide positive lightning ground for each flagpole installation.
 - (2) Paint below-grade portions of ground-set flagpole with heavy coat of bituminous paint.

END OF SECTION 10350

SECTION 10425 - SIGNAGE AND PLAQUES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections apply to the work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of signage is indicated on Drawings and as follows:
 - (1) Interior panel signs.
 - (2) Exterior dimensional letters.
 - (3) Cast Metal Plaque
- B. Exterior post-mounted handicap parking signs and other site required exterior site signage is specified on the Civil Drawings.
- C. Illuminated exit signs are specified in a Division 16 section.
- D. Painted fire wall identification Signs are specified in Section 09900 "Painting."
- E. Temporary signage is specified in a Division 1 section.

1.03 QUALITY ASSURANCE

- A. Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of a single manufacturer.

1.04 SUBMITTALS

- A. Shop drawings: Submit shop drawings for fabrication and erection of signs and plaques. Include plans, elevations and large-scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.
 - 1. Submit full size rubbing of cast metal plaque
- B. Product data: Submit manufacturer's technical data and installation instructions for each type of sign required.
- C. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics.
 - (1) Architect will select colors for panel signs from manufacturer's standard colors.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following.
- (1) Manufacturers of Panel Signs and Die-Cut Vinyl Signs:
ASI Sign Systems, Inc.
Leeds Aluminum Letters, Inc.
 - (2) Manufacturers of Dimensional Letters:
A.R.K. Ramos Manufacturing Co., Inc.
ASI Signs Systems, Inc.
Leeds Aluminum Letters, Inc.

2.02 MATERIALS

- A. Signage: For purposes of determining minimum performance and quality standards, interior and exterior signage, as shown and scheduled on Drawings and specified herein, shall be equal to products of Leeds Architectural Letters of Alabama, Inc., 9039 Parkway Drive, Leeds, AL 35094 (205-699-5271/FAX 205-699-3342).
- (1) Other sign manufacturers wishing to be considered must submit their request to the Architect in accordance with the Prior Approval section of the specifications. At the Architect's determination, submissions may require samples and other detailed information needed to compare submitted products to those specified on Drawings. Acceptance of approved submissions will be by written Addendum only. No Exceptions.
- B. Aluminum Castings: Provide aluminum castings of F-214 alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.
- C. Bronze Castings: Provide bronze castings, copper alloy UNS C83600, complying with the requirements of ASTM B584.
- E. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- F. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- G. Anchors and Inserts: Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION

- A. Panel Signs: Fabricate panel signs with edges mechanically and smoothly finished to conform to the following requirements:

- (1) Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions with a tolerance of plus or minus 1/16" measured diagonally.

2.04 GRAPHIC IMAGE PROCESS

- A. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices. Graphic technique for all signage not indicated to have 1/32" raised lettering, braille, or graphics shall be screen process.

Raised Copy: 1/32" high machine-cut text, graphics, and border. Produce precisely formed characters with square cut edges free from burrs and cut marks. No adhesive mounted (surface applied) text, graphics or borders will be accepted.

- (1) Panel Material: 1/8" thick MP Plastic consisting of two-color melamine surface laminate with non-glare surface over phenolic core.

2.05 CAST METAL PLAQUES

- A. Cast Metal Plaques: Fabricate cast metal plaques to comply with requirements specified for metal, border style, background texture and finish and to comply with requirements shown for thickness, size, shape and copy. Produce castings free from pits, scale, sand, holes or other defects. Hand tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to Item (4), "Finish" for other finish requirements.

- (1) Metal: Aluminum
- (2) Border: Raised flat band, as indicated on Drawings.
- (3) Background Texture: Manufacturer's standard dark leatherette finish.
- (4) Finish: Two coats of clear acrylic lacquer.
- (5) Size: Approximately 24" high x 30" wide.
- (6) Text: To be furnished by Architect - 300 letters maximum per Plaque.
- (7) Letter Style: Times Roman.

2.06 DIMENSIONAL LETTERS

- A. Cast Letters: Form individual letters by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs, for installation on face brick wall. Comply with requirements indicated for finish, style and size.

- (1) Metal: Aluminum
- (2) Letter Height and Wording: 14" high letters in two (2) rows, reading "SOUTHSIDE STATION ONE".
- (3) Letter Style: Equal to Metal Arts Style No. 106 Helvetica Medium.
- (4) Finish & Color: Equal to Metal Arts No. 30 Colored Satin anodized; Final color to selected by Architect from manufacturer's standard colors..
- (5) Flush Mounting: Equal to Metal Arts Method "FMM-1" or "FMM-2", for mounting to face brick wall. Final location of letters to be determined in the field.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Locate sign units and accessories where shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - (1) Install sign units level, plumb and at the height indicated, with surfaces free from distortion or other defects in appearance.
- B. Panel Signs: Attach panel signs to surfaces using the methods indicated on Drawings or as recommended by manufacturer.
- C. Dimensional Letters: Mount letters using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - (1) Flush Mounting: Mount letters with backs in contact with the wall surface.

3.02 CLEANING AND PROTECTION

- A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.03 SCHEDULE OF INTERIOR AND EXTERIOR SIGNAGE

- A. As indicated on Drawings.

END OF SECTION 10425

SECTION 10520 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of fire extinguishers and cabinets is indicated on drawings.
- B. Definition: "Fire Extinguishers" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.
- C. Types of products required include:
- (1) Fire extinguishers.
 - (2) Fire extinguisher cabinets.

1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain products in this section from one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating and classification of extinguisher indicated.

1.04 SUBMITTALS

- A. Product Data: Submit product data for each type of product included in this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
- Amerex Corporation.
 - J.L. Industries
 - Larsen's Mfg. Co.
 - Watrous, Inc.

2.02 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

- (1) Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not, necessarily to type and amount of extinguishing material contained in extinguisher.

- B. Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in red enameled steel container, for Class A, Class B and Class C fires.

2.03 EXTINGUISHER CABINETS

- A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.
- B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.
- C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:
 - (1) Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth
- D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
 - (1) Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - (a) Rolled-Edge Trim with 4-inch backbend depth.
 - (b) Trim Metal: Aluminum
- E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
 - (1) Aluminum: Manufacturer's standard flush, hollow aluminum door construction.
 - (2) Door Glazing: Tempered float glass complying with ASTM C 1048, Quality q3, Type I, Class as follows:
 - (a) 1/8" thick clear glass, Class 1 (transparent).
- F. Door Style: Manufacturer's standard design with full-glass panel.
- G. Door Hardware: Provide Manufacturer's standard door-operating hardware of proper type from cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.04 ALUMINUM FIRE EXTINGUISHER CABINET FINISHES

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

- C. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Class II "Clear Satin" Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. 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.
- B. 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.

END OF SECTION 10520

SECTION 10730 - ALUMINUM CANOPY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Part 1 Specifications sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Extent and location of aluminum canopies is indicated on the Drawings and by provisions of this section, as follows:
 - 1. Suspended Aluminum Canopies over Entrances at locations shown on the drawings.
- B. Provide Aluminum Deck, Beams, Fascia/Gutter, Wall Flashings, Anchors and all accessories required for complete canopy installation systems.
- D. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Joint Sealants - Division 7
 - 2. Light gauge metal stud framing – Division 5
 - 3. Face Brick and Concrete Unit Masonry – Division 4
 - 4. Exterior Insulation and Finish System – Division 7
 - 5. Flashing and Sheet Metal Trim – Division 7

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, details, installation instructions and general product recommendations.
- B. Shop Drawings: Submit complete shop drawings, including all necessary plan dimensions, elevations and details. General Contractor shall field-verify all dimensions and elevations as shown on Shop Drawings, before releasing to manufacturer for fabrication.
- C. Certification: Submit design calculations that are signed by a Registered Professional Engineer, stating that the aluminum canopy system designs comply, in all respects, with the specified loading requirements.

1.04 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation.

1.05 DESIGN PARAMETERS:

- A. Aluminum canopy system shall be designed, fabricated and erected to support all dead loads, and the requirements of the **2015 International Building Code** for live load, horizontal and uplift wind loads.

1.06 QUALITY ASSURANCE:

- A. Aluminum canopy systems shall be wholly produced by a recognized manufacturer with at least 5 years experience in the design and fabrication of aluminum walkway cover systems.

Components shall be assembled in shop to greatest extent possible to minimize field assembly. **Aluminum Canopy systems shall be installed by the Manufacturer or his approved installer**, after all masonry and EIFS work are complete. Locations of any concealed fasteners or components required for the canopy installation shall be coordinated with all trades prior to completion of masonry and/or EIFS finish work.

1.07 DELIVERY AND STORAGE:

- A. Deliver and store all items in protected area. Keep free of any damage. Replace any damaged items or parts at no cost to the Owner.

1.08 COORDINATION:

- A. Provide necessary anchors, flashings and other items required to be built-in, in ample time to avoid delays in the Work and coordinate installation of same with related trades.

PART 2 - PRODUCTS

2.01 AVAILABLE MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

Evans Awning Company, Decatur, AL
Mapes Industries, Inc.
Superior Metal Products Co., Birmingham, AL
Tennessee Valley Metals, Inc. - Oneonta, AL (**Basis of Design**)

- B. PRIOR APPROVAL: Other manufacturers will be considered, subject to the following conditions:
 - (1) Other manufacturers wishing to submit bids must provide required data on proposed product and submit same in accordance with the Prior Approval section of these specifications.
 - (2) Complete details, including sizes of all members and structural calculations showing loads applied in accordance with these specifications must be submitted to the Architect for review.
 - (3) List of comparable projects completed within the last five (5) years must be submitted to the Architect for review.

2.02 MATERIALS

- A. Aluminum Members: All sections shall be extruded aluminum 6063 alloy, heat-treated to T-6 temper.
- B. Fasteners: Fasteners for anchorage of canopy column brackets, gutter/fascia and framing to structural concrete and other substrates shall be as shown and described on Drawings. Other fasteners shall be aluminum, 18-8 stainless steel, 300-series stainless steel or 410 stainless steel. Trim rivets may be aluminum.
- C. Gaskets: Gaskets shall be dry-seal santoprene pressure type.
- D. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.03 COMPONENTS

- A. Aluminum Beams: Beams shall be open-top or closed-top tubular extrusions, of sizes and shapes as shown on Drawings.
- B. Aluminum "Flush" Roof Panels at Suspended Canopies: Composed of self-supporting panels with interlocking side joints, accurately roll-formed into a nominal 8" x 3" deep "Flush" (as viewed from underside) panel at suspended canopies in 0.32" thick aluminum (minimum dimensions and gauges).
- (1) NOTE: Interlocking side joints are designed to provide a load-bearing lock.
- (2) Aluminum shall be 3003-H16 Alloy in .032" minimum. Finish shall be baked-on-polyester, coated two sides, with manufacturer's standard color on topside of panel and on underside as selected by Architect.
- D. Structural Roof Perimeter:
- (1) Gutter/Fascia: Extruded from 6061-T6 aluminum alloy, accurately extruded to designs shown on drawings, to serve as built-in gutter for roof drainage. Fascia for corner sections shall be of the same material and design and be heliarc welded. Gutter/Fascia is to be nominal 8" high box style with .080" thick walls.
- (2) See Drawings for gutter outlet locations.
- (3) Install gutter/fascia at all sides and all ends of canopies.
- E. Component Accessories: Including but not limited to anchors, deflector plates, post brackets, flashing and related accessories as indicated on Drawings, and as required for a complete canopy systems installation.
- (1) Component accessories shall be of similar materials and finishes as specified for prime components. Each part of its use shall be described in the engineering prints and calculations provided by manufacturer.
- F. Hardware: All bolts, nuts, washers, and screws used in joining the members of the canopy together shall be stainless steel up to 1/4" diameter nominal size. Any hardware 1/4" diameter and larger shall be galvanized to withstand 200 hours salt spray test of maximum resistance to rust and corrosion.
- G. Flashings: Flashing and Counter-flashing at building walls shall be formed from .040" thick aluminum (min.), and shall be finished to match the canopy. The canopy manufacturer shall furnish and install all flashings related to their products.

2.04 FACTORY FINISHING

- A. Electrostatically applied, baked-on, high solid polyester paint. Colors as selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Installation shall be in accordance with the instructions and recommendations of the manufacturer and erected straight and true in accordance with standard construction procedures.

- B. Erect canopy straight and true in accordance with standard construction procedures.
 - (1) Erection shall be performed after all face brick has been cleaned and EIFS work is complete.
- C. Attach anchors and flashings to new concrete slab and to building walls, as indicated on Drawings.

3.02 INSTALLATION

- A. Erection: Deflectors shall be installed at all "wet" columns and routed through face brick surround as shown on drawings.

3.03 PROTECTION

- A. Protect all materials during and after completion. Upon completion, all surfaces of work shall be left in a clean condition. Repair all scrapes, mars or other blemishes as recommended by manufacturer. Replace all items damaged beyond acceptable repair.

END OF SECTION 10730

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

- A. Extent of each toilet and bath accessory is indicated and scheduled on Drawings.
- B. Types of toilet and bath accessories required include the following:
 - (1) Toilet tissue dispensers
 - (2) Grab bars
 - (3) Mirrors
 - (4) Feminine Napkin Disposal Units
 - (5) Shelf with Mop & Broom Holders
 - (6) Paper towel dispensers
 - (7) Shower Curtain Rod, Curtain & Hooks
 - (8) Towel Bar
 - (9) Soap Dish
 - (10) Air Blade Electric Hand Dryers are specified in Division 26 Electrical

1.03 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.
- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories which may be incorporated in the work include, but are not limited to, the following:

Bobrick Washroom Equipment, Inc.
Bradley Corporation

- B. In order to establish a standard of design and quality, catalog numbers on Drawings refer to Bobrick products. Equal items by above manufacturers will be accepted, subject to submission in accordance with the Prior Approval section of these specifications.

2.02 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished or satin finish, 22 gage (.34") minimum as indicated.
- B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.40") minimum, unless otherwise indicated, Surface preparation and metal pretreatment as required for applied finish.
- C. Galvanized Steel Sheet: ASTM A 527, G60.
- D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- E. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FSDD-M-411.
- (1) Mirrors shall be guaranteed against silver spoilage for a minimum of ten (10) years.
- 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.

2.03 SPECIFIC TOILET ACCESSORIES

- A. Provide all accessories as indicated at "Toilet Accessories Schedule", on Drawings.

2.04 FABRICATION

- A. General: Only an unobtrusive stamped logo of manufacturer, as approved by Architect is permitted on exposed face of toilet or bath accessory units. 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, General: Except where otherwise indicated, 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, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.
 - (1) Provide concealed wood blocking in drywall partitions as required for anchoring of accessories.

3.02 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION 10801

SECTION 101123 - TACKBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections apply to the work of this section.

1.02 DESCRIPTION OF WORK

- A. Extent of tackboards (T.B.) is indicated on the drawings.
- B. Types of tackboards specified in this section include the following:
 - (1) Plastic impregnated cork tackboards.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Furnish all tackboards by a single manufacturer for the entire project.

1.04 SUBMITTALS

- A. Shop drawings: Submit shop drawings for each type of marker board and tackboard. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout and installation details.
- B. Product data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.
- C. Samples: Submit full range of color samples for each type of marker board, tackboard, trim and accessory required. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.
- D. Certification: Submit the manufacturer's certification that materials furnished for the project comply with the specified requirements.

1.05 SIZES

- A. All tackboard units shall be 4'-0" high by lengths indicated on drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - (1) American Chalkboard Co., Inc.
 - (2) Carolina Chalkboard Co.
 - (3) Claridge Products and Equipment, Inc.
 - (4) Greensteel, Inc.

2.02 MATERIALS

- A. Plastic Impregnated Cork Tackboards: Provide seamless sheet, 1/4" thick round natural cork compressed with a resinous binder with washable vinyl finish and integral color throughout, laminated to burlap backing. Provide color and texture as scheduled or as selected from the manufacturer's standards.
- (1) Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4" thick hardboard backing.
- B. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062" thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
- (1) Clear Anodized Finish: Furnish exposed aluminum trim, accessories and fasteners with the manufacturer's standard satin anodized finish with clear anodic coating complying with AA requirements for Class II Architectural Coating (AA-A31).
- (2) Map Rail: Furnish map rail at the top of each tackboard unit, complete with the following accessories:
- (a) Display Rail: Provide continuous cork display rail approximately 1" wide, integral with the map rail.
- (b) End Stops: Provide one end stop at each end of the map rail.
- (c) Map Hooks: Provide 2 map hooks with flexible metal clips for each 4' of map rail or fraction thereof.

2.03 FABRICATION

- A. Assembly: Provide factory assembled tackboard units.
- (1) Make joints only where the total length exceed the maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
- (2) Provide the manufacturer's standard vertical joint system between abutting sections of tack board.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Field Measurements: Take field measurements prior to the operation of shop drawings and fabrication where possible, to ensure proper fitting of the work. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.

3.02 INSTALLATION

- A. Deliver factory-built tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb and level. Provide

all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories necessary for a complete installation.

- C. Coordinate factory assembled units with grounds, trim and accessories. Join all parts with a neat, precision fit.

3.03 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and function properly.
- B. Clean units in accordance with the manufacturer's instructions.

END OF SECTION 101123

SECTION 11110 – LAUNDRY EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Division 1 Specification Sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

- A. This Summary includes the following types of laundry equipment:
 - (1) Commercial Type Washer-Extractor at Laundry Room 130.
 - (2) Commercial Type Gas Dryer at Laundry Room 130.
 - (3) Light Commercial Type Washing Machine at Laundry Room 130.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - (1) Plumbing connections for laundry equipment are specified in Division 15.
 - (2) Electrical services and connections for laundry equipment are specified in Division 26.
- C. Laundry Equipment shall be furnished and installed under Base Bid.

1.03 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each laundry equipment type, indicating compliance with requirements, including installation instructions. Provide complete operating and maintenance instructions.

1.04 QUALITY ASSURANCE

- A. Energy Ratings: Provide appliances that carry labels indicating energy costs analysis (estimated annual operating costs) and efficiency information as required by Federal Trade Commission.
- B. UL and NEMA Compliance: Provide electrical components required as part of laundry equipment that are listed and labeled by UL and comply with applicable NEMA standards.
- C. Provide products from the same manufacturer for each type of laundry equipment required.

1.05 DELIVERY, STORAGE AND HANDLING

A. ACCEPTANCE AT SITE:

1. Inspect laundry equipment for damage prior to acceptance. If damage is found, follow freight handler's procedure for claims.

B. STORAGE AND PROTECTION

1. Laundry equipment should be stored in a site protected from weather, direct sunlight and temperature extremes. Do not remove packaging prior to storage.
2. If laundry equipment is to be stored for an extended period of time, consult manufacturer for special requirements.

1.06 SYSTEM STARTUP AND COMMISSIONING

- A. Laundry equipment installation should be inspected by local manufacturer's representative prior to startup and operation. The party installing the machine is responsible for setting the schedule for this inspection.

1.07 WARRANTIES

- A. **Warranty:** Submit written warranties executed by the manufacturer of specified laundry equipment agreeing to repair or replace units or components that fail in materials or workmanship within the specified warranty period.
- (1) Three years, limited, parts only, commencing on Date of Substantial completion
- B. Warranties specified above shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 STANDARD OF QUALITY

- A. For purposes of establishing a basis of expected quality and intent, the laundry equipment indicated on the Drawings and specified herein is based on equipment as manufactured by **Alliance Laundry Systems - UniMac**. Other laundry equipment manufacturers will be considered for approval, subject to submission in accordance with the Prior Approval section of these specifications.

2.02 EQUIPMENT ITEM "W1" - AUTOMATIC LAUNDRY WASHER-EXTRACTOR

- A. Quantity: Two (2) required.
- B. Locations: One (1) at Laundry Room 130.

C. Model Number: **UniMac UWN045K1LX** with 5 Compartment Soap Box

D. System Description

1. Construction: 304 or equal stainless-steel cylinder, tub and cover panels
2. Input voltage: 208/1, 2-3 wire plus ground
3. Dry weight capacity: 45 lb. (20.4 kg)
4. Wash cylinder volume: 7.21 cu ft (204164 cu cm) minimum
5. Overall width: 34.12 inches (867 mm) nominal
6. Overall height: 64.63 inches (1642 mm) nominal
7. Overall depth: 44.33 inches (1126 mm) nominal
8. Number and size of water connections: 2 with 3/4-inch (19 mm) NH male connections
9. Number and size of drain outlets: 1 at 3 inch (76 mm)
10. Overflow: Internally plumbed
11. Control system: Programmable microprocessor
12. Cylinder drive: Single motor, 5 hp with inverter drive, capable of 518 RPM through a direct drive poly V-belt system

E. Control system: Programmable microprocessor; (manual, PDA or laptop PC)

1. 30 programmable cycles
2. 30 programmable water levels
3. Cycle counter
4. Temperature controlled fill and thermal cool down
5. Water monitoring: fill valve, slow drain and automatic leak detection system
6. Diagnostic capabilities

F. Drain valve automatically opens in event of power failure

2.03 EQUIPMENT ITEM "D1" - AUTOMATIC LAUNDRY GAS DRYER

A. Quantity: Two (2) required.

B. Locations: One (1) at Laundry Room A03 and one (1) at Laundry Room C54

C. Model Number: **UniMac UT050NUO**

D. System Description:

1. Dry weight capacity: 50 lb. (22.7 kg)
2. Cylinder volume: 18.67 cu ft (528676 cu cm) minimum
3. Construction: Heavy duty embossed steel with e-coat and baked enamel powder paint
4. Input voltage: 120/1

5. Heat source: Gas, natural, 1/2 inch (13 mm) NPT
6. Overall width: 38-5/8 inches (981 mm) nominal
7. Overall height: 76-5/8 inches (1946 mm) nominal
8. Overall depth: 47 inches (1194 mm) nominal
9. Exhaust size: 8 inch (203 mm)
10. Control system: Microprocessor touchpad control
11. Door: High grade stainless steel reversible door with 7/8 inch (22 mm) rubber gasket and heavy duty hinge.

PERFORMANCE REQUIREMENTS:

1. BTU input: 130,000
2. Airflow: 750 CFM (21.2 CMM)
3. Recommended gas pressure: 6.5 water column inches
4. Motor horsepower: 1/2 hp
5. Control system
 - a. Programming methods: Machine keypad, Infrared (PC or PDA)
 - b. 41-Cycle Capability with graphic display of words and icons
 - c. PC software to program machine and/or audit machine performance with quick view performance reports
 - d. Record start, stop and idle time by date and time
 - e. Record last eight machine errors by date and time
 - f. Record machine service history
 - g. Internet connectivity for off-site diagnostic capabilities
 - h. Automatic maintenance reminders by day, week and month
 - i. Over Dry Prevention Technology (OPTidry[™]) system utilizes two cylinder lifters as sensors (note: some capacities only have one sensor lifter)
 - j. Maintenance-free rotary transfer switch communicates signal between OPTidry[™] sensor/lifters and control

2.04 EQUIPMENT ITEM "W2" - TOP LOADING LIGHT COMMERCIAL WASHER

- A. Quantity: Three (3) required.
- B. Locations: One (1) at Laundry Room 130.
- C. Model Number: **UniMac UWNMN2SP112CW01**
- D. System Description:
 1. Operation: Manual control
 2. Basket Volume-cu: 3.26(92.3)
 3. Spin Speed - RPM: High Speed - 710 / Low Speed - 473
 4. Water Temperatures: Hot, Warm and Cold
 5. Cycles: Normal, Permanent Press or Delicate
 6. Cycle Time: 16-31 minutes plus fill time

7. Water Pressure-psi (bar): Pressure Fill 20 to 120 (1.418.3)
8. Cycle Cue Lights: Yes
9. Color: White
10. Motor: 2-speed, 1/2 HP reversing for 1725 or 1140 RPM
11. Electrical Specifications: 120/1-15 arll)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Comply with manufacturer's instruction and recommendations.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: Refer to Division 15 and 16 for plumbing and electrical requirements.

3.02 ADJUST AND CLEAN

- A. Testing: Test each item of equipment to verify proper operation. Make necessary adjustments.
- B. Cleaning: Remove packing material and leave units in clean conditions, ready for operation.

END OF SECTION 11110

SECTION 12304 – MODULAR LAMINATE CASEWORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and provisions of the contract including General Conditions, Supplementary Conditions, and Division 1, apply to this contract.

1.02 WORK INCLUDED:

- A. Furnish and install all high-pressure laminate casework and accessories as shown and listed on drawings and specified herein, including:
 - 1. Base and/or Wall Cabinets at locations indicated on Floor Plans and Interior Elevations.
 - 2. Wardrobe Units and Desk at locations indicated on Floor Plans and Interior Elevations.
 - 3. Open, adjustable Shelving Units at locations indicated on Floor Plans and Interior Elevations.
 - 4. Filler panels, trim and accessories, as necessary for a complete casework installation.
- B. The Casework Subcontractor shall verify all critical building dimensions prior to fabrication of casework. The Casework Manufacturer shall re-engineer the casework arrangements to dimensions requiring 2-1/2" or less of filler at each end of wall-to-wall elevations, and to ensure all complete and satisfactory installation.
- C. Provide all labor for unloading, distribution, and installation of casework and related items as specified.
- D. Provide cutouts for electrical outlets.
- E. Provide caulking of casework and tops to walls.

1.03 WORK RELATED SPECIFIED ELSEWHERE:

- A. Rough Carpentry: Wood blocking within walls to adequately support casework.
- B. Division 6 Section 06650 "Solid Polymer Fabrications".
- C. Finished Base, as scheduled on Drawings and specified in Division 9 Sections.
- D. Division 16: Electrical: Furnishing, installation, and final connections of wiring, conduit, and/or electrical items within casework (not indicated herein to be furnished under this Section), shall be performed by the Electrical Subcontractor in compliance with state and local codes.

1.04 STANDARD OF QUALITY:

- A. APPROVED MANUFACTURERS:

- CASE SYSTEMS, INC.
- STEVENS INDUSTRIES
- LSI
- TMI

1. Casework of other nationally recognized Casework Manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications. Proposed manufacturers' products shall be equal in construction and design, according to Drawings and as specified herein.
2. Other proposed manufacturers shall provide proof of AWI membership and continuous AWI Section 400 and 1600 Premium Grade Compliance.
3. Any manufacturers or dealerships requesting pre-bid approval must show proof of similar projects provided on a continual basis over the last 5 years, by the manufacturer or dealership under current ownership during the past 5 years.

B. Casework shall meet or exceed the following general requirements, including, but not limited to the following:

C.

1. Cabinets must be Mod-Ez fastener or dowel-pinned construction. No stapled, or screwed cabinets will be permitted.
2. All cabinet backs must be captured, 4 sides and be 1/2" thick particleboard with thermos-fused or GP28 laminate finish. No stapled backs or glued backs with shims permitted.
3. No cabinet sides to floor. Separate, factory attached plywood base only.

D. Laminate selections shall be available in a minimum of 300 solid or 50 wood grain colors, as well as 3 thermo-fused interior colors and 75, 3MM edge colors. A maximum of 2 colors per project will be available.

1.05 SUBMITTALS:

- A. Comply with Division 1.
- B. Product Data: Submit the Casework Manufacturers catalog showing casework construction details, and materials and hardware used.
- C. Submit exterior systems in specified colors.
- D. Submit interior systems in specified colors.
- E. Submit five sets of shop drawings showing:
 1. Construction options selection sheet.
 2. Small scale floor plan showing casework in relation to the building.
 3. Large scale elevations and plan views.
 4. Cross-section, service runs, blocking locations and sinks centerlines.
- F. Shop drawings shall be submitted within 21 days of casework contract award.

1.06 WARRANTY:

- A. **All products must be warranted unconditionally for a period of five (5) years on all parts.**

PART II – PRODUCTS

2.01 GENERAL:

- A. Decorative laminated casework shall be Case Systems as specified or approved equal with the following features:
1. ½" Thick Inset and Captured Cabinet Backs
 2. Reveal Overlay Door and Drawer Fronts
 3. Five Knuckle Institutional Grade Hinges
 4. PVC edges applied with hot melt glue, 3MM PVC at Door Edges
 5. Thermo-fused Laminate Interior which exceeds NEMA LD3-1995 for GP-28 Performance
 6. GP-28 Laminate Exterior
 7. Separate and Factory attached Plywood Base Construction
 8. M-3 engineered board for all cabinet components
 9. "Balanced" high pressure laminates applied with rigid PVA glue
 10. Casework shall be independently tested to meet the following minimum performance values:

Base Unit Racking	1460 lb/f
Base Front Joint Loading	725 lb/f
Wall Unit Racking	1600 lb/f
Wall Unit Static Load	2500 lb/f
- B. Color and finish selections shall be as follows:
1. Color and finish selections shall be selected by Architect from the full range of colors and finishes offered by laminate manufacturer.
 2. Open and Closed Interiors shall be white, beige (almond) or grey thermos-fused laminate.

2.02 MATERIALS:

- A. Exterior vertical surfaces:
1. All finished end panels, separate; attachable back panel shall be surfaced with .028" thick high-pressure decorative laminate conforming to NEMA LD3-Latest Edition, GP-28.
 2. Laminate patterns, wood grains, and solid colors will be selected from Formica, Wilsonart, Nevamar or Pionite current non-specialty, non-premium grade offering in laminate manufacturer's standard suede, textured or matte finish. All standard laminate patterns, wood grains and solid colors will be available for both cabinet and countertop selections.
 3. Where wood patterns are selected, grain direction shall be vertical on doors, end panels, and exposed backs; horizontal on drawer fronts and aprons.
 4. All exterior vertical high-pressure laminate panels shall be balanced with textured .020" thick high-pressure cabinet liner conforming to NEMA Standard LD3-Latest Edition, CL-20. Surface texture shall be similar to exterior finish.

B. Hardware:

1. Pulls: (Epoxy Coated Wire)
 - a. One 128 mm wire; finish as selected by Architect.
2. Hinges: (Epoxy Coated 5 Knuckle)
 - a. Hinges shall be epoxy-coated steel, five-knuckle hospital-tip institutional grade quality with .87" diameter tight pin. Residential, kitchen type pivot, plain butt, or hinges with removable pins "SHALL NOT BE ACCEPTABLE". Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges. Finish as selected by Architect.
3. Drawer Slides:
 - a. Standard Drawer: Self-closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100# rating, must be self-closing within last 3% of travel and must prevent drawer fronts from contacting the cabinet body.
4. Door Catches:
 - a. Base and Wall Cabinets: 7-pound magnetic catch.
5. Adjustable Shelf Supports:
 - a. Shelf supports shall be injected molded clear plastic, with a double pin engagement 32 mm on center and shall have ¾" and 1" anti-tip locking tabs. Capable of supporting 125 pounds each.

2.03 CONSTRUCTION:

- A. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners or Dowel Pin as approved by the Architectural Woodwork Institute Quality Standard, 8th Edition – 2003 Sections 400 A-T-12, 400 B-T-10 and 1600-T-11. Also as approved by the Woodwork Institute of California's "Manual of Millwork" Section 15-6.2.195. They shall be specifically designed for use in joining particleboard panels.
- B. All joints are tight fitting and will not rupture or loosen due to:
 1. Dimensional changes in the particleboard.
 2. Racking of casework during shipment and installation.
 3. Normal use.
 4. All fastening devices and screws shall be treated to deter or resist corrosion.
- C. Construction features – All cabinets:
 1. All structural components shall be ¾" thick with balanced surfaces.
 2. All back panels shall be:
 - a. ½" thick surfaced both sides for balanced construction.
 - b. Fully captured on both sides and bottom: face-mounted, stapled backs are not acceptable.
 3. Mounted stretchers are ¾" thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.

4. When the rear of a cabinet is exposed, a separate finished $\frac{3}{4}$ " thick decorative laminate back panel shall be applied.
5. Exterior Grade Plywood core individual bases, factory applied to base and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. There shall be a front to back center support for all bases over 30" wide.
6. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.
7. Adjustable shelves shall be M-3 engineered board core with balance surfaces and have a nominal 1mm (.020") thick PVC front edge.
 - a. Adjustable shelves 36" and over shall be 1" thick.
 - b. All adjustable shelves in open cabinets shall be 1" thick.
8. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full $\frac{3}{4}$ " thick M-3 engineered board core attached with concealed interlocking mechanical fasteners.

2.04 PERFORMANCE:

A. Laminates:

1. "High Pressure Laminates" shall meet the definition and performance requirements of NEMA LD3-1991. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Countertops shall be GP-50 or PF-42 for Post-Formed Tops. Both provided with proper balancing laminate.
2. Thermo-fused laminate shall meet the performance requirements of NEMA LD3-1991 for GP-28. Panel manufacturer shall provide published specification.
3. Core material shall be engineered board meeting ANSI-A208. 1-lasted, M-3 Industrial Grade.
4. All high-pressure laminate must be laminated using a PVA adhesive, set under pressure, resulting in a rigid glue line. Contact adhesives shall not be used.

PART III – EXECUTION

3.01 SHIPPING:

- A. All casework shall be blanket wrapped and delivered to the storage site in furniture vans.
- B. General Contractor shall provide adequate roadways and access for delivery vans (Tractor Trailers) to within 40 feet of the building. General contractor will also provide adequate dry pathway to the building from the delivery van.

3.02 CASEWORK INSTALLATION

- A. Casework shall not be delivered or stored at the job site until building has become adequately dry and secure. All overhead work (Except Ceiling Tiles) must be complete. The ambient relative humidity must be maintained between 25% and 55% prior to delivery and through the life of the installation.
- B. Installation shall be by Casework Manufacturers authorized representative.
- C. Casework shall be installed plumb and true, and is to be securely anchored in place. Scribe casework fillers as necessary for a tight fit.
- D. Adjustable Shelf Units shall be securely fastened to horizontal blocking or to concrete block, not to plaster, lath, or wallboard. Reinforcement of stud walls shall be provided to appropriate trade during erection of walls. Casework Manufacturer shall accurately locate blocking requirements on shop drawings.
- E. Installation to follow AWI Division 1700, Eighth Edition Guidelines.

3.03 CLEANING AND PROTECTION BY CASEWORK CONTRACTOR:

- A. Wipe out cabinets interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets. Remove all packaging, scraps, and debris resulting from casework installation activities.
- B. PROTECTION AND FINAL CLEANING OF CASEWORK IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

END OF SECTION 12304



SECTION 15000- TABLE OF CONTENTS PLUMBING AND FIRE PROTECTION

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SECTION 15401 – GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes general plumbing requirements. Applies to all Division 15400 sections, except Section 15450's (Fire Protection).

1.02 DEFINITIONS

- A. "Provide" means to furnish and install, complete and ready for operation.

1.03 REFERENCES

- A. AGA: American Gas Association.
- B. ANSI: American National Standards Institute, Inc.
- C. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.
- D. ASME: American Society for Mechanical Engineers.
- E. ASSE: American Society of Sanitary Engineers.
- F. ASTM: American Society of Testing and Materials.
- G. AWWA: American Water Works Association.
- H. CISPI: Cast Iron Soil Pipe Institute.
- I. FM: Factory Mutual.
- J. NAIMA: North American Insulation Manufacturers Association.
- K. NEMA: National Electrical Manufacturers Association.
- L. NFPA: National Fire Protection Association.
- M. NSF: National Sanitation Foundation.
- N. MSS: Manufacturers Standardized Society of the Valve and Fittings Industry.
- O. PDI: Plumbing and Drainage Institute.
- P. UL: Underwriters Laboratories, Inc.

1.04 REGULATORY REQUIREMENTS

- A. Comply with current edition, unless otherwise noted, of the following codes and standards:

1. ANSI B31.9 – Building Services Piping.
2. ADA – American’s with Disabilities Act.
3. ASME – Boiler and Pressure Code.
4. NFPA 30 – Flammable and Combustible Liquids Code.
5. NFPA 31 – Installation of Oil-Burning Equipment.
6. NFPA 54 – National Fuel Gas Code.
7. NFPA 70 – National Electrical Code.
8. NFPA 96 – Standards for Ventilation Control and Fire Protection of Commercial Cooking Operations.
9. NFPA 101 – Life Safety Code.
10. IBC – International Building Code with Fire, Mechanical, Plumbing, and Gas Codes; 2009 Edition.
11. International Energy Conservation Code: 2006 Edition.
12. Local Health Department.

B. Permits, Licenses, Inspections and Fees:

1. Obtain and pay all permits, licenses, inspections and fees, and comply with all rules, laws and ordinances pertaining to the Contractor’s portion of the Work.
2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.05 PRODUCT REQUIREMENTS

A. Provide new standard, materials throughout.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Substitutions:

1. Comply with the provisions of Division 1, Section “Product Requirements” and the following.
2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor’s bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor’s proposal. Coordination with other trades for

substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.

3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
4. The basis of design manufacturer's equipment and scheduled Plumbing equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
 - a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
 - b. Equipment of higher or lower 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 at no additional cost to the Owner.
 - c. Prior to approval of submittals of plumbing equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
 - d. If minimum energy ratings or efficiencies are specified, equipment shall comply with specified requirements.
5. Each Bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:
 - a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
 - b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
 - c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.

6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.06 SUBMITTALS

- A. Submit under provisions of Division 1, Section "Submittal Procedures" and the following.
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 15400 Sections of Division 15.
 1. List shall be complete with manufacturer names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 2. Call attention to deviations from specified items as to operation and physical dimensions.
 3. Include performance curves for pumps.
 4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted."
 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project Close-Out Documents.

1.07 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
 1. Acceptable to, or licensed by, manufacturer.
 2. Not less than 3 years experience with systems.
 3. Successfully completed no less than 5 comparable scale projects using systems similar to these for this project.
 4. Current Master Plumbing's Certificate and Master's Gas Certificate issued by the State, County, and City in which the work occurs.

1.08 SUMMARY OF WORK

- A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all plumbing work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.
- B. Equipment Furnished by Others:
 1. Connect to all equipment shown on plumbing drawings that require plumbing connections.

2. Provide piping, shut-off valves, and unions required for a complete installation.
3. Equipment furnished by others include:
 - a. Casework.
 - b. Ice machines.
 - c. Pantry units.
 - d. Coffee makers.

1.09 DRAWING INTERPRETATION AND COORDINATION

- A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.
- B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.
- C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.
- D. Where doubt arises as to the meaning of the drawings and specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- E. Refer to Architectural Drawings for all dimensions.

1.10 PROJECT / SITE CONDITIONS

- A. Visiting Site: Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.
- B. Determine sizes, locations, and inverts of existing and new utilities near site.
- C. Cause as little interference or interruption of existing utilities and service as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.11 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit under provisions of Division 1, Sections "Closeout Procedures" and "Project Record Documents" and the following.
- B. Record Drawings:

1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Plumbing drawings.
 2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
 3. Record changes daily on a set of prints kept at the job site.
 4. Submit prints marked as noted above to Architect for review prior to request for final payment.
 5. Marked prints will be returned to Contractor for use in preparing Record Drawings.
 6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.
- C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. Record drawings – plumbing piping (reproducible) and electronic files in AutoCAD.
 2. Equipment Submittal Data (2).
 3. Equipment operating and maintenance manuals (2).
 4. Equipment warranty dates and guarantees (2).
 5. Pressure vessel certificates (2).
 6. Certificate of Disinfection of domestic water lines.
 7. List of Owner's Personnel who have received operating and maintenance instructions.
 8. Install valve charts and valve location plans in main mechanical room. (See Division 15, Section "Plumbing Identification").
 9. Submit factory start-up/field reports for:
 10. Current Flow Test.
 - a. Domestic water heaters.

END OF SECTION 15401

SECTION 15403 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Description of common piping, equipment, materials and installation for Plumbing systems.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most Plumbing piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Concrete.
 - 6. Grout.
 - 7. Escutcheons.
 - 8. Access doors - Building.
 - 9. Protection and cleaning of equipment and materials.
 - 10. Flashing
 - 11. Workmanship.
 - 12. Cutting and patching.
 - 13. Excavation, trenching and backfilling.
 - 14. Connection to existing systems.
 - 15. Piping systems installation - Common Requirements.
 - 16. Equipment installation - Common Requirements.
 - 17. Painting and finishing.
 - 18. Supports and anchorages.

1.02 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. CPVC: Chlorinated polyvinyl chloride plastic.
 - 2. PE: Polyethylene plastic.

3. PVC: Polyvinyl chloride plastic.

1.03 SUBMITTALS

- A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Escutcheons.
4. Access doors - building.

1.04 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:

1. Fully dimensioned off column lines with location respective to adjacent walls shown.
2. Sleeve size.
3. Pipe size and insulation thickness.
4. Pipe service.

1.05 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. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 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 and inserts in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate installation of building access doors for Plumbing items requiring access that are concealed behind finished surfaces.
- D. Electrical Characteristics for Plumbing Equipment:
1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.

2. If minimum energy ratings or efficiencies are specified, equipment shall comply with these requirements.
3. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Plumbing equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.01 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 one of the following:

2.02 PIPE, TUBE AND FITTINGS

- A. Refer to individual Division 15 Plumbing 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.

2.03 JOINING MATERIALS

- A. Refer to individual Division 15 Plumbing 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-flushable 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.
- G. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer according to ASTM F656.
 - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Model 24).
 - 3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.04 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. For pipe sizes NPS 2 and smaller: PVC or CPVC, Schedule 80, one-piece fitting; one end with threaded brass insert, and one solvent-cement socket or threaded end.
 - 2. For pipe sizes larger than NPS 2: Flanged joints.
- B. Fitting-Type Transition Couplings:
 - 1. Manufactured piping coupling or specified piping system fitting.

2.05 DIELECTRIC FITTINGS

- A. Dielectric Nipples:
 - 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America; Clearflow Dielectric Waterway Style 47.
 - 2. Zinc electroplated steel nipple with inert and noncorrosive, thermoplastic lining; treaded ends; and 300 psig minimum working pressure at 230 deg F. Ring-groove to lock liner to steel casing and provide indentifying roll marking.
- B. Dielectric Flanges:

1. Manufacturers:
 - a. Capital Manufacturing.
 - b. Central Plastics.
 - c. Watts.
 - d. Wilkins, a Zurn Company.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. End Connections: Solder-joint or thread copper alloy and thread ferrous.
5. Dielectric Flange Insulating Kits:
 - a. Non-conducting materials for field assembly or companion flanges.
 - b. Gasket: Neoprene or phenolic.
 - c. Bolt Sleeves: Phenolic or polyethylene.
 - d. Washers: Phenolic with steel backing washers.

2.07 SLEEVES

- A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Firestopping Sealant: See Division 7 Sections "Through-Penetration Firestop Systems" and "Fire Resistive Joint Systems" for firestopping sealant requirements.
- D. Stuffing Insulation: Glass fiber type, non-combustible.

2.08 CONCRETE

- A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.09 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and non-metallic, 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.

2. Packaging: Premixed and factory packaged.

2.10 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.

2.11 ACCESS DOORS – BUILDING

- A. Manufacturers:

1. Bilco.
2. Milcor.
3. Nystrom.

- B. Construction:

1. Door: 14-gauge, cold rolled steel.
2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
3. Hinge: Concealed spring hinge.
4. Latch: Screwdriver cam latch.
5. Finish: Phosphate dipped and prime coated.
6. UL labeled when in fire-rated construction with rating to match construction.
7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.

- C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.12 FLASHING

- A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

- B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.

- C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

- D. Shower Pans: Specified in Division 9, Section "Ceramic Tile."

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. First class and in accordance with best practice. Work to be orderly, neat, appearance and performed by skilled craftsman.

- B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

- A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Plumbing work. Repair and finish to match surrounding.
- B. Architect's approval required before cutting any part where strength or appearance of finished work is involved.
- C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.
- D. Core drill or saw cut openings in existing masonry construction.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

- A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.
- B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 2. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.
- D. Refer to Division 15, Plumbing Piping Sections for specific bedding and backfill requirements.
 - 1. For factory or field insulation or coated piping, the bedding shall be a minimum of 6 inches of sand. The first 12 inches of backfill above the pipe shall be sand.
- E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.
- F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.04 DEMOLITION:

- A. Refer to the Architectural Demolition Plans for areas to be demolished and remove all fixtures noted to be removed.
- B. All fixtures and equipment noted "To Be Removed" on the drawings shall remain the property of the Owner. If Owner decides against retention of any or all items this Contractor shall remove from the site.
- C. Where fixtures are removed, remove all abandoned or unused piping back to main or nearest active connection and cap or plug.
- D. When vent stack(s) thru roof(s) are abandoned leave existing vent stack thru roof in place, cut pipe and cap as close as possible to underside of roof deck.

- E. Coordinate all system shut down with Owner. Request shut down minimum 72 hours prior to scheduled shut down period. Do not shut down any system without approval of Owner. Perform shut down at premium time if required.
- F. Refer to Architectural Demolition Plans for fixtures to be removed.

3.05 CONNECTIONS TO EXISTING SYSTEMS:

- A. Make connections to existing systems only at time authorized, in writing, by Owner.
- B. Do not take system out of service during occupied working, office or school hours.
- C. Drain existing systems and fill, vent, test, balance and put existing systems into operation after connections have been made.
- D. Repair existing insulation at points of connection to existing work.

3.06 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Plumbing Sections specifying piping systems.
- B. Drawings, 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.
- 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 in 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. No mitering or notching for fittings permitted.
- 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 where exposed, non-insulated piping penetrates walls, ceilings, and floors in finished spaces.

3.07 SLEEVES

- A. Sleeves are not required for core-drilled holes, or wall hydrants.
 - 1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length so that sleeve extends out 1/2 inch from both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Use the following sleeve materials:
 - a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
 - b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.
 - 4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.
 - 5. Above ground, non-rated, exterior 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 "Joint Sealants" for materials and installation.
 - 6. Provide for continuous insulation wrapping thru sleeve.
 - 7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.
- C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 7 Sections "Through Penetration Firestop Systems" and "Fire Resistive Joint Systems".

3.08 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Plumbing Piping Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs.
- 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.
- G. Flanged Joints:
1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
 2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. 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. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 3. PVC Non-pressure Piping: Join according to ASTM D 2855.
- I. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

3.09 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller 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. Wet Piping Systems: Install dielectric fittings to connect piping materials of dissimilar metals.

3.10 PIPE CLEANING

- A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.11 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are 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 equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.
- E. Install equipment to allow right of way for piping installed at a required slope.
- F. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

3.12 PAINTING AND FINISHING

- A. Except as specified below or noted on the Drawing, requirements for painting of Plumbing systems, equipment, and components are specified in Division 9 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

- C. Paint water pipe and insulation downstream of backflow preventor (non-potable water) to termination point, or to connection with mechanical system piping, yellow.
- D. Painting of mechanical piping:
 - 1. The following piping within boiler and chiller room shall be painted in its entirety under Division 9: Painting. Color codes are listed here for information only.
 - a. Domestic Cold Water: Dark Blue, Metalatex B42L4.
 - b. Domestic Hot Water: Rose Red, Metalatex B42 (mix of R6 and W101).
 - 2. Should there be a conflict of colors in existing installations, contact the Architect.

3.13 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" requirements.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing 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 ACCESS DOORS – BUILDING

- A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.
- B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.16 FLASHING

- A. Provide flexible flashing and metal counter-flashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.
- B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.
- C. Flashing for vent and soil pipes through the roof and roof drains specified under Division 7.
- D. Flashing floor drains and floor sinks in floors with topping over finished area with lead, 10-inches clearance sides with minimum 36x36 inch sheet size. Fasten flashing to drain clamp device.
- E. Seal floor and shower drains water tight to adjacent materials.

3.17 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

- A. Equipment, fixtures, and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.
- B. At completion of all work, thoroughly clean, exposed materials (pipe, etc.), equipment, and fixtures and make ready for painting.

END SECTION 15403

SECTION 15405 - PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following plumbing identification materials and their installation:
 - 1. Pipe markers.
 - 2. Valve tags.
 - 3. Valve schedules.
 - 4. Equipment labels.
 - 5. Warning signs and labels.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve numbering scheme.
- C. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.03 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.

1.04 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

2.01 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 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. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

2.02 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 approved by Architect. Provide 5/32-inch hole for fastener.
1. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.
 2. Valve-Tag Fasteners: Brass wire-link chain, beaded chain or S-hook.

2.03 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
 2. Frame: Extruded aluminum.
 3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.04 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 2. Color Coding:

<u>System</u>	<u>Background Color</u>	<u>Letters</u>
Other equipment	Black	White

3. Temperatures up to 160 deg F.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 5. Letter shall be a minimum of 1/2" high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 6. Fasteners: Stainless-steel self-tapping screws.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.05 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: Minimum 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information as indicated elsewhere in the specifications and on the Drawings.

PART 3 - EXECUTION

3.01 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 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 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
- B. Locate pipe markers and color bands where piping is exposed or above accessible ceilings 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. 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 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. Label 2 psi gas piping at 5 foot intervals.

3.03 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections. List tagged valves in a valve schedule.
- B. 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:
 - a. Cold Water: **2 inches square.**
 - b. Hot Water: **2 inches square.**
 - c. Gas: **2 inches square.**
 2. Valve-Tag Color:
 - a. Cold Water: **Black**
 - b. Hot Water: **White**
 - c. Gas: **Yellow**
 3. Letter Color:
 - a. Cold Water: **White.**
 - b. Hot Water: **White.**

c. Gas: **White**.

3.04 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

END OF SECTION 15405

SECTION 15407 - PLUMBING SYSTEMS INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and Accessories.
- C. Equipment Insulation.
- D. Covering.

1.02 RELATED SECTIONS

- A. Division 7 – Firestopping.
- B. Division 15 – Section 15405 “Plumbing Identification.”
- C. Division 15 – Section 15410 “Plumbing Piping”: Placement of hangers and hanger inserts.

1.03 SUBMITTALS FOR REVIEW

- A. Section 15401: Procedures for submittals.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing insulation work with minimum 3 years experience.

1.05 REGULATORY REQUIREMENTS

- A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 or UL 723.
- B. All insulation materials, adhesives, mastic and coating shall be asbestos free.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufactures for Fiberglass Insulation Materials:
 - 1. Owens-Corning.
 - 2. Certaniteed.
 - 3. Knauf.
 - 4. Manville Corporation

- B. Acceptable Manufacturers for Foamed Plastic Closed Cell Elastometric Insulation Materials:
 - 1. Armstrong AP.
 - 2. Rubatex.
- C. Acceptable Manufacturers for Adhesives, Mastics and Coatings:
 - 1. Armstrong.
 - 2. Benjamin Foster.
 - 3. Childers.
 - 4. Marathon.

2.02 GLASS FIBER PIPE INSULATION

- A. Manufacturer: Owens-Corning Model SSL-11.
- B. Insulation: ASTM C547; rigid molded, noncombustible.
 - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum service temperature: 850 degrees F.
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket:
 - 1. White kraft paper with glass fiber yarn, bonded to aluminized film.
 - 2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive:
 - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
 - 1. ASTM C195; hydraulic setting on mineral wool.

2.03 FOAMED PLASTIC PIPE INSULATION

- A. Manufacturer: Armaflex AP.
- B. Insulation: ASTM C534; flexible cellular elastomeric insulation, pre-slit or slip on.
 - 1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
 - 2. Minimum service temperature: -40 degrees F.
 - 3. Maximum service temperature: 220 degrees F.
 - 4. Moisture vapor absorption: ASTM D1056; 5.0 percent by weight.
 - 5. Moisture vapor transmission: ASTM E96; 0.10 perm-inches.
 - 6. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried adhesive, compatible with insulation.
- D. Protective Coating: Weather resistant, compatible with insulation.

- E. Do not use in plenum unless meets ASTM E-84 flame spread rating of less than 25 and smoke density rating of less than 50.

2.04 JACKETS – PIPING AND EQUIPMENT

- A. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E84.
- B. PVC Jacket.
 - 1. Jacket: ASTM D1784, one piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum service temperature: 0 degrees F.
 - b. Maximum service temperature: 150 degrees F.
 - c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
 - d. Thickness: 20 mil.
 - e. Connections: Brush on welding adhesive.

2.05 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 jacketed 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.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that piping and equipment have been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Fit pipe hangers over insulation.
- E. Inserts and Shields:
 - 1. Application: Protect insulated piping at hangers and supports with insulation shield. On pipe sizes over 2 inches, provide insert.
 - 2. Insulation Protection Shield: Galvanized steel formed in half circle to fit insulation. Length and gauge as follows:
 - a. Up to NPS 4: 12 inches long and 22 gauge.
 - b. NPS 6: 18 inches long and 22 gauge.
 - c. NPS 8 through 12: 24 inches long and 18 gauge.
 - d. NPS 14 and Large: 24 inches long and 16 gauge.
 - 3. Insulation-Insert Material: Water repellent treated, ASTM C533, Type I calcium silicate; or ASTM C552, Type II cellular glass of same thickness and vapor barrier jacket specified for surrounding insulation. Insert shall be a minimum of 2 inches longer than the shield.
 - 4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
 - 5. For Clevis Hangers: Insert shall cover lower 180 degrees of pipe.
 - 6. Option: At Contractor's option, insert may be factory fabricated Thermal Hanger Shield (insulation insert encased in sheet metal shield) equal to Pipe Shield, Inc. "Insulated Pipe Supports."
 - 7. Option: At Contractor's option, steel pipe saddles may be used on hot water pipe in lieu of insert and shield. Fill interior void of saddle with insulation that matches adjoining insulation.

- F. Continue insulation through metal studs, walls, sleeves, pipe hangers, and other pipe penetrations. Finish firestopping at supports, protrusions, and interruptions. At fire separations, refer to Division 7 and Section 15410: Sleeves.
- G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 GLASS FIBER PIPE INSULATION APPLICATION

- A. Provide vapor barrier jackets, factory or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding stapes 4 inch on center and vapor barrier mastic.
- B. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- C. **Finish fittings exposed in equipment rooms, boiler rooms and in finished spaces with vinyl acrylic mastic over glass fab.**
- D. For hot piping do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

3.04 FOAMED PLASTIC PIPE INSULATION APPLICATION

- A. Pipe insulation may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected pipe.
- B. Fabricate fittings from mitered sections of pipe insulation.
- C. Cement all joints and seams per manufacturer's instructions.

3.05 SCHEDULES - PIPING

A. Plumbing Piping:

1. Domestic Cold Water, Above Grade:

a. Glass Fiber Pipe Insulation

- 1) All pipe sizes: 1 inch thick.
- 2) Pipes located in walls armaflex: ½ inch thick.

b. Foamed Plastic Pipe Insulation

- 1) All pipe sizes: 1 inch thick.
- 2) Pipes located in walls armaflex: ½ inch thick.

2. Domestic Hot and Recirculating Water Interior, Above Grade:

- a. Glass Fiber Pipe Insulation
 - 1) All pipe sizes: 1-1/2 inch thick.
 - 2) Pipe located in walls: 1 inch thick.
- b. Foamed Plastic Pipe Insulation
 - 1) All pipe sizes: 1-1/2 inch thick.
 - 2) Pipes located in walls armaflex: 1 inch thick.

3.06 INSTALLATION – EQUIPMENT INSULATION GENERAL

- A. Install in accordance with NAIMA Insulation Standards.
- B. Factory Insulated Equipment: Do not insulate.
- C. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires or bands.
- E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- G. Finish insulation at supports, protrusions, and interruptions.
- H. Equipment in Mechanical/ Boiler Rooms or Finished Spaces: Finish with canvas jacket.
- I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

END OF SECTION 15407

SECTION 15410 - PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves for the following piping systems:
 - 1. Sanitary, waste and vent piping.
 - 2. Domestic, hot and cold water piping.
 - 3. Natural gas piping.
 - 4. Compressed Air piping.
 - 4. Fire protection piping.
 - 5. Valves and specialties.

1.02 RELATED SECTIONS

- A. Section 15401 – General Plumbing Requirements.
- B. Section 15403 – Basic Plumbing Materials and Methods.
- C. Section 15405 – Plumbing Identification.
- D. Section 15407 – Plumbing Systems Insulation.

1.03 SUBMITTALS FOR REVIEW

- A. Division 1 – Submittals and Section 15401: Procedures for submittals.
- B. Provide product data on the following:
 - 1. Pipe materials, pipe fittings and accessories.
 - 2. Manufacturers catalogue data and cut sheets on all fixtures and equipment.
 - 3. Valve data and ratings.
- C. Manufacturer's drawings of listed closing methods to be used to close penetrations through rated assemblies.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with the City of Glencoe, Alabama, codes and standards.
- B. Perform sanitary sewer work beyond 30 inch of building in accordance with County Standards.
- C. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 - PRODUCTS

2.01 SANITARY WASTE AND VENT PIPING:

- A. Waste and vent piping to be Schedule 40 PVC plastic pipe.
- B. Copper DWV Tube:

1. Pipe: ASTM B306, DWV.
2. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
3. Joints: 50-50, ASTM B32, solder, Grade 50B.

E. PVC Pipe:

1. Pipe: ASTM D1785, Schedule 40 and ASTM D2265.
2. Fittings: ASTM D2465, PVC.
3. Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.
4. Use heavy duty no -hub clamps (Mission or Husky), when transitioning from cast iron to PVC
5. Foam Core PVC will not be allowed. Solid wall pipe only.
6. Pipe and Fittings by one manufacturer.

2.02 WATER PIPING, BELOW SLAB ON GRADE OR BELOW GRADE

- A. Water Piping less than 3 inch; copper tube;
- B. Water piping: Copper tube.
- C. Copper Tubing:
1. Pipe: ASTM B88, Type K soft copper.
 2. Fittings: ASME B16.22 wrought copper and bronze.
 3. Joints: "Sil-Fos".
 4. Piping to be installed to minimize the number of joints below grade of or below slab on grade.
 5. Encase all below ground copper piping in plastic sleeve or 1/2" unsplit foam insulation.

2.03 WATER PIPING, ABOVE GRADE

- A. Water piping 4 inch and smaller, copper tube;
- B. Water piping: copper tube.
- C. Copper Tubing:
1. Pipe: ASTM B88, Type L, hard drawn.
 2. Fittings: ASME B16.22, wrought copper and bronze.
 3. Joints: ASTM B32, 95-5 solder, Grade 95TA, lead free with lead free flux.
- D. Insulation:
1. Insulate all water piping (cold, hot and hot return) above slab on grade with 1" fiberglass insulation. Insulation thickness may be reduced to 1/2 inch walls. Foam type insulation may be used in concrete block walls. (Armaflex or approved equal)
 2. Insulation shall be installed continuous through walls.

3. See Section 15407 of the specifications for insulation description.

E. Identification:

1. Identify all piping in accordance with Section 15405 of the specification.

2.04 NATURAL GAS PIPING, BELOW GRADE

A. Plastic Pipe:

1. Pipe: ASTM S-1248 polyethylene for grade P24, Class B (PE 2406).
2. Fittings: Injection molded as described in ASTM-D-2683 and ASTM D-3216 Federal Department of Transportation Title 49 Part 192 minimum safety regulations and API 15 LE for polyethylene lines.
3. Joints: Butt fused in accordance with manufacturers recommendations.
4. Trace all below grade pipeline with single strand #16 yellow insulated copper wire laid directly on top of piping prior to covering pipe extended above grade and wrapped around pipe at each termination point.

2.05 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe:

1. Pipe: ASTM A53 Schedule 40 black.
2. Fittings: ASME B16.3, malleable iron.
3. Joints: NFPA 54, threaded with Teflon tape applied to male threads only.

B. Copper Tubing:

1. Pipe: Type "L" ASTM B68 or B75, general purpose.
2. Fittings: ASME B16.22, wrought copper.
3. Joints: Flared or "Sil-Fos."

- C. All gas piping in the 2 psi system shall be labeled with plastic labels indicating 2 psi at the beginning of the system, at the end of the system and at intervals not exceeding six feet.

2.06 COMPRESSED AIR PIPING

A. Compressed Air Piping: copper tube.

B. Copper Tubing:

1. Pipe: ASTM B88, Type L, hard drawn.
2. Fittings: ASME B16.22, wrought copper and bronze.
3. Joints: ASTM B32, 95-5 solder, Grade 95TA flux.

2.07 FLEXIBLE PIPE CONNECTIONS

A. Stainless steel corrugated tubing with stainless steel wire braid.

B. Working pressure 200 psi minimum.

- C. End connections 2" and smaller-male pipe threads, larger than 2" flanged.
- D. Manufacturers: Minnesota Flexible Corporation, Metaflex, Flexicraft and Hyspan.

2.08 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
 - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Pipe Size Over 2 Inches:
 - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
 - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.09 PIPE HANGERS AND SUPPORTS

- A. Hangers:
 - 1. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods or Unistrut multiuse channel.
 - 4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 - 6. Vertical Support: Steel riser clamp.
 - 7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 8. Copper Pipe Support when applied directly to the copper piping: Copper steel ring, adjustable.
 - 9. Install hanger over insulation on insulated pipe with sheet metal saddle rolled on the ends centered in hanger. See Section 15407.
- B. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- C. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
- D. For fasteners in existing concrete structures, use drilled in expansion anchors with load rating 150% greater than the pipe hanger rating. Note: Powder drive anchors are not acceptable.
- E. Beam Clamps: Grinnell Figure #229.

2.10 BALL VALVES

- A. Up to and including 2 inches:
 - 1. Manufacturers:
 - a. Watts Model LFB-6080 or LFB-6081, full port.
 - b. Nibco, Apollo, Milwaukee, Kitz.
 - 2. MSS-SP-110 Class 125, bronze body, chrome plated full port ball, ptfе seats and seals, blow-out proof stem and threaded ends.
- B. 2-1/2 and larger:
 - 1. Manufacturers:
 - a. Watts LFG-4000 Series.
 - b. Nibco Model T-580-70, S-580-70, T-FP-600N, or S-FP-600N
- C. Compressed air valves: All bronze, 150 psig WP, chrome plated bar stock ball, full port Teflon seats, stem packing seal and thrust washer, Watts B-6080 or B-6081, Apollo 20-100, Red White 5044F or 5094F, Kitz 56 or 57. Provide valve handle extension to (minimum 1") clear insulation.

2.11 SWING CHECK VALVES

- A. Up To and Including 3 Inches:
 - 1. Manufactures:
 - a. Nibco Model S-413-B.
 - b. Crane, Stockham, Milwaukee, Kitz.
 - 2. MSS SP-80, Class 125, bronze body and cap, bronze trim and seat, threaded ends.
- B. Larger than 3"
 - 1. Manufactures:
 - a. Nibco Model F-918-B.
 - b. Crane, Stockham, Milwaukee, etc.
 - c. MSS SP-71, Class 125, iron body, bronze trim flanged ends.

2.12 WATER PRESSURE REDUCING VALVES

- A. Provide water pressure reducing valve at the service entry on all buildings where main pressure is in excess of 80 psi. Set out pressure at 70 psi.
- B. Up To and Including 2 Inches:
 - 1. Manufactures:

- a. Watts Model U5B.
 - b. Wilkins, Cash, Acme.
 - 2. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, internal by-pass, inlet strainer, threaded ends with single union and ball valve upstream of strainer.
- C. Over 2 Inches:
- 1. Manufactures:
 - a. Watts Model ACV-115-74C.
 - b. Williams, Cash, Acme.
 - 2. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.
- D. Provide pressure gage (0-150 PSI) with needle valve stop on leaving side of pressure reducing valve

2.13 NATURAL GAS VALVES

- A. Manufactures:
- 1. 2" and smaller:
 - a. Watts Series FBC-1, Conbraco Series GB-10, Nibco GB-1, GB-2, T-FP600.
 - 2. Larger than 2":
 - a. Rockwell 143 lubricated 175 psi.
 - 3. All gas valves shall be third party listed.

2.14 GAS PRESSURE REGULATOR

- A. System Regulator: Equal to American Meter Co. Model 1813B with built-in over pressure shut off, size and capacity as shown on drawings.
- B. Appliance Regulator: Equal to American Meter Company J-78 for sizes ½", ¾" and 1" and J-48 for sizes 1"-3".
- C. Regulator valves shall be full line size with capacity as shown on Drawings. Provide regulators with positive shut-off and vent limiting device. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior one pipe size larger than vent discharge and elbow down with screened opening per ASME CSD-1 requirements. Provide pressure gauges on inlet and outlet side of all regulators.
- D. Gas regulators for building heating finned-tube boilers are specified to be provided with the boiler. Plumbing contractor to install and adjust regulator per regulator manufacturer's instructions. Provide pressure gauges on inlet and outlet side of all regulators. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe

relief line to exterior, one pipe size larger than vent discharge connection and terminate with elbow down with screened opening per ASME CSD-1 requirements.

2.15 THERMOMETERS

- A. Lights actuated digital thermometer reading in degrees Fahrenheit. Provide with well for minimum 1" insulation.
- B. Weiss Vari-angle Digital Thermometer.

2.16 SLEEVES

- A. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

2.17 FIRE STOP SYSTEM

- A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. Listed assembly compatible with the rating of the wall or floor being penetrated.
- B. Non-rated walls:
 - 1. Sheet rock joint compound may be used to seal opening. Insulation to be continuous through wall.
- C. For piping passing through sheet rock walls or partitions:
 - 1. Insulated pipe passing through 2 walls or partitions – Hilti FS605 with sleeve U.L. Listing #WL1056.
 - 2. Insulated pipe passing through 2 hour walls or partitions – Hilti FS611A with no sleeve, U.L. Listing #WL5029. Insulation to be continuous through sleeve.
- D. For piping passing through concrete floors, concrete walls or concrete block walls:
 - 1. Uninsulated Schedule 40 steel on copper pipe: Hilti #F5605 with sleeve, U.L. #CAT155.
 - 2. Insulated Schedule 40 steel on insulated copper pipe: Hilti #FS6114A, U.L. #CAT5045.
- E. For non-metallic piping passing through concrete floors, walls or concrete block.
 - 1. 2" and smaller piping: Hilti #FS611A, U.L. #CAT2062 or U.L. #CAT2065.
 - 2. Larger than 2": Hilti #FS611A with collar, U.L. #CAT095.

2.18 FLASHING

- A. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Cut pipe square and ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.02 PIPING INSTALLATION GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Provide dielectric fittings wherever jointing dissimilar metals.
- C. Make piping connections to equipment with flanges or unions.
- D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- E. Run piping concealed, except where specifically shown to be exposed.
- F. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- G. Group piping whenever practical at common elevations.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- I. Provide clearance in hanger and from structure and other equipment for installation of insulation and access to valves and fittings.
- J. Provide access where valve is not accessible. Provide minimum 18"x18" access doors at valves in hard ceiling.
- K. Establish elevations of buried pressure piping outside the building to ensure not less than 18 inches of cover.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09900.
- N. Install chrome plated floor, wall and ceiling plates on all exposed piping passing through finished surfaces in finished spaces.
- O. Install bell and spigot pipe with bell end upstream.
- P. Install valves with stems upright or horizontal, not inverted.
- Q. Install water piping to ASME B31.9. PDI shock arrestors are required to be installed on all branchlines.

R. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, or in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors not acceptable).

S. Pipe Hangers and Supports:

1. Support horizontal piping as scheduled.
2. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, trapeze hangers may be used.
7. Provide copper hangers and supports when applied directly to copper piping.
8. Prime coat exposed steel hangers and supports located outdoors, in crawl spaces, pipe shafts. Above suspended ceiling spaces is not considered exposed.
9. Provide hangers adjacent to motor driven equipment.
10. Support cast iron drainage and vent piping at every joint and minimum 5'-0" on center.
11. Support of all pipe, tubing and fixtures and equipment shall be accomplished by means of engineered products specified to each application. Makeshift, field devised methods of plumbing pipe supports, such as scrap wood, wire or duct tape are not allowed. These shall be HoldRite, B-Line, Sioux Chief or approved equal.

T. Provide pipe line markers and valve tags in accordance with other sections of the specifications.

U. Sleeves:

1. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

V. Flashing:

1. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

3.03 EXCAVATION AND BACKFILLING

- A. Refer to Division 15, Section "Basic Plumbing Materials and Methods" for requirements.

3.04 APPLICATION

- A. Install unions at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system.
- C. Install valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Provide check valves on discharge of water pumps.
- E. Provide flow indicators in water recirculating systems where indicated.

3.05 ERECTION TOLERANCES

- A. Slope all sanitary waste piping and storm piping at a minimum 1/8" per foot. Slope all sanitary sewer piping 2" and smaller below slab on grade at a minimum 1/4" per foot.
- B. Arrange all water piping to drain to low points and provide ball valve with plug at low point.

3.06 SANITARY, WASTE AND VENT SYSTEM

- A. Install vent stacks through roof. Terminate 12 inches above finish roof and minimum 10'-0" from HVAC roof top unit outside air intakes. Flashings for penetrations are under another section.
- B. Connect to site sanitary sewer approximately 5'-0" from building. Verify exact size, location and invert with Civil Drawings prior to beginning work.
- C. Connect to existing sanitary sewer where shown on drawings. Contractor shall confirm exact size, invert, location, and direction of flow prior to installing any new piping.
- D. Insulate all mechanical floor drain bodies and horizontal piping between drain and connection to stack on elevated floors.

3.07 WATER PIPING SYSTEM

- A. Connect to site water service approximately 5'-0" from building installed under another section. Verify with Civil drawings exact size and location of site water service.

3.08 NATURAL GAS PIPING SYSTEM

- A. Arrange with local gas company to provide new gas service complete with connection to gas main, service from main to meter and meter installation all per gas company's requirements. Include all costs associated with new meter and service.
- B. Provide regulators on each line serving gas appliance sized in accordance with equipment requirements. Regulators shall have vent limiting device as required by local code or shall be vented to the exterior. Provide pressure gauge on inlet and outlet side of all regulators.
- C. Install no gas piping beneath slabs on grade. Where gas pipe must be installed below building slabs, install in steel encasement with vent to atmosphere. See detail on drawings.
- D. Where gas piping is installed exposed on the roof, the piping shall be installed on Erico PP50H6 pipe pier supports with integral strut channel.
- E. Where piping installed out of doors, coat all piping and joints with Sherman Williams "TARGUARD" coal tar epoxy. Do not coat joints until after testing and inspection. Clean rust from pipe prior to applying coating.
- F. Install union plug valve or gas shut-off and dirt pocket at each piece of equipment.

3.09 FIELD QUALITY CONTROL

- A. Perform all tests as required by local codes. Contractor shall furnish testing equipment and keep a record of all testing listing tests made, results and those witnessing test. Include testing record in close out documents.
- B. If local codes are more stringent than the following, local codes shall govern.
- C. Sanitary, Waste, and Vent Water Systems:
 - 1. Test piping by stopping lower outlets and filling to 10 feet hydrostatic head for a minimum period of 15 minutes with all joints exposed throughout test. Stop all leaks and retest system until tight.
 - 2. Test all piping by stopping all outlets and applying 5 pounds per square inch of air pressure to the system for a period of 15 minutes. Stop all leaks and retest system until tight.
 - 3. Provide ball test on all piping 3" and larger. Three Tests are usually required by U.A. Facilities Dept.
- D. Domestic Water Piping:
 - 1. Hydrostatic test at 150 psig without pressure drop for 4 hours. Stop all leaks and retest system until free from leaks.
 - 2. Leave City pressure on system for duration of project.
- E. Natural Gas Piping:
 - 1. Air pressure test at 25 psig without pressure drop for 4 hours.
 - 2. Black steel piping below grade shall be Holiday tested prior to backfilling.

F. COMPRESSED AIR PIPE TESTS:

1. On completion of roughing-in, cap oil outlets, and test all piping at 150 psig for four (4) hours with 0 psig loss. Stop all leaks shown up by test and repeat until piping is air tight.
2. Testing medium must be Air or Nitrogen.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify hot and cold water systems are complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6.
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 ppm residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 ppm, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water.
- H. Submit sample of water from all new or modified systems to local Health Department and receive certification that water is acceptable for human consumption. Include certification of water in close out documents.

3.11 SCHEDULES

- A. Pipe Hanger Spacing:
 1. Metal Piping:
 - a. Pipe size: ½ to 1-1/4 inches:
 - 1) Maximum hanger spacing: 6.5 ft.
 - 2) Hanger rod diameter: 3/8 inch.
 - b. Pipe size: 1-½ to 2 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 3/8 inch.
 - c. Pipe size: 2-½ to 3 inches:
 - 1) Maximum hanger spacing: 10 ft.
 - 2) Hanger rod diameter: 1/2 inch.
 - d. Pipe size: 4 to 6 inches:
 - 1) Maximum hanger spacing: 10 ft.

- 2) Hanger rod diameter: 5/8 inch.
 - e. Pipe size: 8 to 12 inches:
 - 1) Maximum hanger spacing: 14 ft.
 - 2) Hanger rod diameter: 7/8 inch.
 - f. Pipe size: 14 inches and over:
 - 1) Maximum hanger spacing: 20 ft.
 - 2) Hanger rod diameter: 1 inch.
2. Plastic Non-Metallic Piping:
- a. All Sizes:
 - 1) Maximum hanger spacing: 4 ft.
 - 2) Hanger rod diameter: 3/8 inch.

END OF SECTION 15410

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Plumbing fixtures.
- B. Plumbing miscellaneous equipment.

1.02 RELATED SECTIONS

- A. Section 15401 – Basic Plumbing Requirements.
- B. Section 15403 – Basic Plumbing Materials and Methods.
- C. Section 15405 – Plumbing Identification.
- D. Section 15407 – Plumbing Systems Insulation.
- E. Section 15410 – Plumbing Piping.

1.03 SUBMITTALS FOR REVIEW

- A. See Section 15401, Submittal for Review.
- B. Plumbing Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, trim and finishes.

1.04 SUBMITTALS AT PROJECT CLOSEOUT

- A. Refer to Division 1 and Section 15401 – Submittals for Project Closeout.
- B. Maintenance Data: Provide 3 sets of manufacturer's maintenance and parts listing including the manufacturers nearest sales and service representative. Include the sales representative's address and telephone number. Provide with the listing, a suggested maintenance schedule for all equipment along with warranty dates. Items are to be provided in three ring binders with tabs identifying different equipment types.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Accept fixtures on site in factory packaging, inspect for damage and store.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

- A. See other sections of the specification for additional warranty information.
- B. The Contractor shall warrant all materials, workmanship and equipment for a period of one year from the date of substantial completion. Any defect in equipment or workmanship shall be made known to the Contractor within 1 year. Such deficiencies shall be corrected by the Contractor at no cost to the Owner.

1.09 EXTRA MATERIALS

- A. See other sections of the specification for additional extra material requirements.
- B. Provide two sets of washers for all faucet types, two flush valve repair kits for all flush valve type and one loose key for each hose bibb or wall hydrant.

PART 2 - PRODUCTS

2.01 CLEANOUTS

- A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angle, upper terminals and not over 75 feet apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk tapered slotted plugs, except PVC and acid waste piping cleanouts, which shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, piping larger than 6" shall have minimum 6" cleanout covers.
- B. Exposed Cleanouts: Cast brass plug type, J.R. Smith #4470.
- C. Wall type cleanout plug and access covers, J.R. Smith #4472. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic and waste pipe in wall; cleanout access cover J.R. Smith 4710.
- D. Install wall cleanouts on stacks at flush valve fixtures 12" above top of flush valve, 12" above top of flush tanks, 12" above finish floor on sinks, lavatories and water coolers and 12" above grab bars at fixtures with grab bars. Locate cleanouts to clear baseboard at floor.
- E. Floor type cleanout access covers: J.R. Smith #4248-NB. Plug must be within 3" of finished floor. Provide J.R. Smith #4188 where installed in terrazzo floors and J.R. Smith #4168 where located in floor with asphalt or vinyl tile covering. Grout cleanout below access cover to seal watertight. Provide option "Y" cleanout carpet markers where installed in carpeted floors.
- F. Floor type cleanout covers for acid waste piping: J.R. Smith #4940.

- G. Outside Cleanouts: J.R. Smith #4258 cleanout access encased in a 18" X 18" X 6" deep concrete pad. See Detail on Drawings.

2.02 PLUMBING FIXTURES AND EQUIPMENT

- A. Water Heaters with side feed connections shall be installed with a vacuum relief valve equal to a Watts No. 36A installed in the cold water line. The relief valve shall be located down stream of the cold water cut-off valve and minimum 6" above the top of the heater.
- B. All "wetted" domestic potable fixtures, piping materials, valves shall meet the Federal Lead Free Guidelines. All materials shall be clearly marked and submitted with complete data during submittal review.
- C. Unless otherwise specified, all fixtures complete as catalogued, commercial grade, white color, exposed metal trim chromium plated.
- D. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lug bolts in all holes as recommended by the manufacturer.
- E. Flush valve "YJ" supports shall be installed 1 inch below vacuum breaker on all water closet flush valves and around vacuum breaker on urinal flush valves. Handles on A.D.A. water closets to be installed on wide side of room or stall.
- F. Seal wall hung fixtures at wall with white silicone sealant. Seal countertop fixtures with clear silicone sealant.
- G. Mount all fixtures at standard mounting height unless otherwise noted.
- H. All faucets to be furnished with ceramic discs.
- I. Furnish sinks and lavatories with correct number of drillings required for the faucet and accessories. Hole covers are not acceptable.
- J. All similar products shall be by the same manufacturer.
- K. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall.
- L. Provide Symmons "Maxline" LF5-210-CK thermostatic mixing valve or approved equal under all public and A.D.A. lavatories. Set hot water temperature at 109 deg F.
- M. All items complete as catalogued as follows: Reference schedule sheets

2.03 FOOD SERVICE EQUIPMENT

- A. All equipment is furnished and set in place under the Food Service Section.
- B. All sink waste outlets, strainers, lever wastes and tailpieces are furnished under Food Service Section.
- C. All faucets are furnished under the Food Service Section.

- D. Under this Section rough and connect in accordance with shop drawings accompanying the equipment.
- E. Under this Section extend all wastes to floor sinks, using D.W.V. copper and securely anchored in the horizontal. Install flow control devices on sink wastes as shown and detailed on drawings.
- F. Receive faucets, furnished under the Food Service Section set, rough, connect and furnish McGuire #165 supplies with stops.
- G. Furnish faucets as specified for each individual piece of equipment.
- H. Furnish McGuire #8912 P-Traps where sink, etc., is not piped to a floor sink.

2.04 ACCEPTABLE MANUFACTURERS

- A. Where Kohler is listed above, Zurn or American Standard may be substituted.
- B. Where Sloan is listed above, Zurn may be substituted.
- C. Where J. R. Smith is listed above, Josam, Zurn, Mifab, Watts, or Wade may be substituted.
- D. Where Elkay water coolers are mentioned above, Oasis, or Acorn may be substituted, only if water ways are constructed of totally lead free materials.
- E. Where Armstrong is listed above, the equal of B & G, Taco, Grundfos or Thrush may be substituted.
- F. Where Church is listed above, Bemis, Beneke, Centoco, Olsonite or Comfort Seats may be substituted.
- G. Where Stern Williams is listed above, Acorn or Fiat may be substituted.
- H. Where EBC is listed above for traps, outlets and stops, McGuire, Kohler, Crane, Eljer or American Standard may be substituted.
- I. Where Chicago is listed above for shower valves, Leonard, Powers or Lawler may be substituted.
- J. Where EBC-IK is listed above, Pro-wrap by McGuire, "Handi Lav-Guard" by Truebro, "Trap-Wrap" by Brocar Industries, Inc. or Plumberex may be substituted.
- K. Where Amtrol is listed for expansion tanks, Watts or Armstrong may be substituted.
- L. Where Navien is listed, Rinnai or Noritz may be substituted.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify all electrical characteristics of electrical motors, starters and equipment with Electrical Drawings. Should the Contractor change the characteristics of the electrical

equipment, it shall be the responsibility of the Contractor to coordinate all changes with the other trades and bear all costs of such changes.

- B. Coordinate all cutouts in millwork and casework with supplier for proper cutout dimensions.
- C. Install all fixtures and equipment in accordance with manufacturer's recommendations.
- D. All wall hung fixtures are to be installed on floor mounted fixture supports. Fixture supports are to be anchored to floor with anchors in all mounting holes. Anchors to be sized as per the manufacturers recommendations. Seal all fixtures to walls and floor with white silicone sealant. Seal all sinks to counter tops with clear silicone sealant.
- E. Adjust all stops, flush valves and valves for intended water flow rate.
- F. Clean plumbing fixtures and equipment and remove tags.
- G. Install all electric water heaters with clearance for removal of heating elements.
- H. Provide backing in wall for flush valve YJ brackets, faucet supports, etc. Anchor to the backing with anchoring screws of sufficient length to penetrate backing. See Section 15410, Part 3.
- I. Provide stops with chrome-plated nipples penetrating wall and cover penetrations with chrome-plated escutcheons. Note: Compression type stops and plastic stems are not acceptable.

END OF SECTION 15440

SECTION 15451 - GENERAL FIRE PROTECTION REQUIREMENTS

PART ONE - GENERAL:

1.1 RELATED DOCUMENTS

- A. Division 1 – Section “ALTERNATES”: Coordinate related Division 15 work and modify surrounding work to integrate the Work of each Alternate.

1.2 SUMMARY

- A. Description of General Fire Protection Requirements. Applies to all Division 15, Section 15450's (Fire Protection).

1.3 DEFINITIONS

- A. "Provide" means to furnish and install, complete and ready for operation.

1.4 REFERENCES

- A. ASME: American Society for Mechanical Engineers.
- B. ASTM: American Society of Testing and Materials.
- C. AWWA: American Water Work Association.
- D. FM: Factory Mutual.
- E. NEMA: National Electrical Manufacturer's Association.
- F. NFPA: National Fire Protection Association.
- G. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.
- H. UL: Underwriters Laboratories, Inc.

1.5 REGULATORY REQUIREMENTS

- A. Comply with current edition, unless otherwise noted, of the following codes and standards.
 - 1. ANSI B31.9 - Building Services Piping.
 - 2. ADA - American's with Disabilities Act.
 - 3. NFPA 13 – Installation of Sprinkler System.
 - 4. NFPA 30 – Flammable and Combustible Liquids Code.
 - 5. NFPA 31 – Installation of Oil-Burning Equipment.
 - 6. NFPA 54 – National Fuel Gas Code.
 - 7. NFPA 70 - National Electrical Code.
 - 8. NFPA 101 - Life Safety Code.
 - 9. IBC - International Building Code with Fire, Mechanical, Plumbing and Gas Codes; 2015 Edition.
- B. Permits, Licenses, Inspections and Fees.
 - 1. Obtain and pay for all permits, licenses, inspections and fees, and comply with

all rules, laws and ordinances pertaining to the Contractor's portion of the Work.

2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.6 PRODUCT REQUIREMENTS

- A. Provide new standard, materials throughout.
- B. Multiple items of similar equipment shall be the product of the same manufacturer.
- C. Substitutions:
 1. Comply with the provisions of Division 1, Section "Product Requirements" and the following:
 2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor's bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor's proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.
 3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
 4. The basis of design manufacturer's equipment and scheduled Fire Protection equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
 - a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
 - b. Equipment of higher or lower 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 at no additional cost to the Owner.
 - c. Prior to approval of submittals of Fire Protection equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
 5. Each bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be

considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:

- a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
 - b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
 - c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.
6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.7 SUBMITTALS

- A. Submit under provisions of Division 1, Section "Submittal Procedures" and the following:
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 15450 Sections of Division 15.
 1. List shall be complete with manufacturer's names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 2. Call attention to deviations from specified items as to operation and physical dimensions.
 3. Performance curves for pumps shall be included.
 4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted".
 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.
- C. Shop Drawings: Before starting work, submit and obtain approval from Architect of detailed drawings of the following, fully dimensioned and drawn to 1/8" to 1'-0" scale. Submit six (6) prints of each drawing. Engineer will return five (5) of the prints with comments noted. Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation.
 1. Fire Protection Systems. See Division 15, Section "Fire Protection System."
 2. For multi-story buildings, submit detailed floor penetration sleeve layout drawings. See Division 15, Section "Plumbing Basic Materials and Methods," Article "Informational Submittals."

1.8 COORDINATION DRAWINGS

- A. General:
 1. Within 60 days of Notice to Proceed provide Coordination Drawings for the following the building:
 2. Do not base Coordination Drawings on reproduction of Contract Documents or standard printed data.
 3. Submitted Coordination Drawings are for information only and typically will not be returned to the Contractor. Architect will not take any action, but may

define coordination conflicts or problems and inform the Contractor of such conflicts or problems.

- B. Content:
1. Project specific information, drawn accurately to scale.
 2. Show sequencing and spatial relationship of separate units of work that must function in a restricted manner to fit in the space provided, or function as indicated.
 3. Indicate dimensions shown on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- C. Format:
1. Coordination shop drawings shall be drawn to a scale of not smaller than $\frac{1}{4}" = 1'-0"$.
 2. Provide drawings on electronic media in AutoCad .dwg format.
 3. Provide layering system separate from wall outline and unique to each discipline.
 4. In addition to plan view, provide sections as required to clarify congested situations and verify vertical clearances.
 5. Base drawings and building sections in .dwg format will be provided by Architect.
- D. Fire Protection Shop Drawings: Fire Protection subcontractor shall add all fire protection equipment, piping, sprinkler heads and other elements to database.
1. Upon completion of Fire Protection shop drawings, transmit electronic database to Electrical subcontractor.
- E. General Contractor's Final Coordination: General Contractor shall thoroughly review shop drawings, adding additional building elements where appropriate, and shall resolve conflicts, coordinating with the Architect, and the various subcontractors.
- F. Submit Coordination Shop Drawings: Upon completion of final coordination, General Contractor shall approve coordination shop drawings and transmit 3 sets of hard copies and electronic files on CD's to Architect.

1.9 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
1. Acceptable to, or licensed by, manufacturer.
 2. Not less than 3 years experience with systems.
 3. Successfully completed not less than 5 comparable scale projects using systems similar to those for this project.
 4. Professional Engineer licensed in the State in which the work occurs; or NICET Level 3 and licensed by the State Fire Marshall in the State in which the work occurs. NICET Level 3 Contractor to supervise / inspect installation.

1.10 SUMMARY OF WORK

- A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all fire protection work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

1.11 DRAWING INTERPRETATION AND COORDINATION

- A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.
- B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.
- C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.
- D. Where doubt arises as to the meaning of the Drawings and Specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- E. Refer to Architectural Drawings for all dimensions and location of lights, ceiling diffusers and sprinkler heads.

1.12 PROJECT/SITE CONDITIONS

- A. Visiting Site: Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.
- B. Determine sizes and locations, and inverts of existing and new utilities near site.
- C. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.13 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit under provisions of Division 1 Sections - "Closeout Procedures" and "Project Record Documents" and the following.
- B. Record Drawings:
 - 1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Fire Protection drawings.
 - 2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
 - 3. Record changes daily on a set of prints kept at the job site.
 - 4. Submit prints marked as noted above to Architect for review prior to request for final payment.
 - 5. Marked prints will be returned to Contractor for use in preparing Record Drawings.

6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.
- C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. Record drawings – fire protection piping (pdf / dwg / reproducibles) and electronic files in AutoCAD.
 2. Equipment Submittal Data (2).
 3. Equipment operating and maintenance manuals (2).
 4. Equipment warranty dates and guarantees (2).
 5. List of Owner's Personnel who have received operating and maintenance instructions.
 6. Install valve charts and valve location plans in main mechanical room. (See Division 15, Section "Plumbing Identification.")
 7. Submit start-up/field inspection reports for:
 - a. Fire system
- D. Contractor's Material and Test Certificate for above ground piping.
- E. Contractor's Material and Test Certificate for underground piping.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 15451

SECTION 15453 - BASIC FIRE PROTECTION MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Description of common piping, equipment, materials and installation for Fire Protection systems.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most Fire Protection piping systems.
 - 2. Sleeves.
 - 3. Concrete.
 - 4. Grout.
 - 5. Escutcheons.
 - 6. Access doors - Building.
 - 7. Flashing
 - 8. Workmanship.
 - 9. Cutting and patching.
 - 10. Excavation, trenching and backfilling.
 - 11. Connection to existing systems.
 - 12. Piping systems installation - Common Requirements.
 - 13. Equipment installation - Common Requirements.
 - 14. Painting and finishing.
 - 15. Concrete bases.
 - 16. Supports and anchorages.
 - 17. Protection and cleaning of equipment and materials.

1.02 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, crawlspace, 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.

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Transition fittings.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.

4. Escutcheons.
5. Access doors - building.

1.04 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:
 1. Fully dimensioned off column lines with location relative to adjacent walls shown.
 2. Sleeve size.
 3. Pipe size.
 4. Pipe service.

1.05 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. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 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 and inserts in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate installation of building access doors for fire protection items requiring access that are concealed behind finished surfaces.
- D. Electrical Characteristics for Fire Protection Equipment:
 1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.
 2. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Fire Protection equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.01 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 one of the following:

2.02 PIPE, TUBE AND FITTINGS

- A. Refer to individual Division 15 Fire Protection 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.

2.03 JOINING MATERIALS

- A. Refer to individual Division 15 Fire Protection 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-flushable 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.

2.05 SLEEVES

- A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Firestopping Sealant: See Division 7 Sections "Through-Penetration Firestop Systems" and "Fire Resistive Joint Systems" for firestopping sealant requirements.
- D. Stuffing Insulation: Glass fiber type, non-combustible.

2.06 CONCRETE

- A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.07 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.08 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.

2.09 ACCESS DOORS – BUILDING

- A. Manufacturers:
 - 1. Bilco.
 - 2. Milcor.
 - 3. Nystrom.
- B. Construction:
 - 1. Door: 14-gauge, cold rolled steel.
 - 2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
 - 3. Hinge: Concealed spring hinge.
 - 4. Latch: Screwdriver cam latch.
 - 5. Finish: Phosphate dipped and prime coated.
 - 6. UL labeled when in fire-rated construction with rating to match construction.
 - 7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.
- C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.10 FLASHING

- A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.
- B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.
- C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. First class and in accordance with best practice. Work to be orderly, neat in appearance and performed by skilled craftsman.
- B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

- A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Fire Protection work. Repair and finish to match surrounding.
- B. Architect's approval required before cutting any part where strength, or appearance of finished work is involved.
- C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.
- D. Core drill or saw cut openings in existing masonry construction.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

- A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.
- B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 2. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.
- D. Refer to Division 15, Fire Protection Piping Sections for specific bedding and backfill requirements.
- E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.
- F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.04 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Fire Protection Piping Sections specifying piping systems.

- B. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas and stairwells.
- D. Install piping indicated to be exposed and in 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. No mitering or notching for fittings permitted.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install escutcheons where exposed piping penetrates walls, ceilings, and floors in finished spaces.

3.06 SLEEVES

- A. Sleeves are not required for core-drilled holes.
 - 1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length so that sleeve extends out ½ inch from both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Use the following sleeve materials:
 - a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.
 - b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.

4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.
 5. Above ground, non-rated, exterior 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 "Joint Sealants" for materials and installation.
 6. Provide for continuous insulation wrapping thru sleeve.
 7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.
- C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 7 Sections "Through Penetration Firestop Systems" and "Fire Resistive Joint Systems".

3.07 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Fire Protection Piping Sections specifying piping systems.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. 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.
- D. Flanged Joints:
1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
 2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.08 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, 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.

3.09 PIPE CLEANING

- A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.10 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are 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 equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.
- E. Install equipment to allow right of way for piping installed at a required slope.
- F. All equipment shall be firmly fastened in place:
 - 1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

3.10 PAINTING AND FINISHING

- A. Except as specified below or noted on the Drawing, requirements for painting of Fire Protection systems, equipment, and components are specified in Division 9 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- C. Painting of fire piping:

1. The following piping within boiler and chiller room shall be painted in its entirety under Division 9: Painting. Color codes are listed here for information only.

- a. Fire Protection Piping: Red Metaltex B47R3.

2. Should there be a conflict of colors in existing installations, contact the Architect.

3.11 CONCRETE BASES

- A. Provide concrete foundations with nominal dimensions conforming to the following schedule for floor-mounted equipment:

<u>Equipment</u>	<u>Foundation</u>
Equipment and piping stands and supports	4" high pad
Equipment located in equipment rooms, not listed above	4" high pad or as indicated on the Drawings

- B. Concrete bases shall be continuous and shall have beveled edges and smooth float finish. Concrete bases shall be reinforced with No. 3 bars a maximum of 12" on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.
- C. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.
- D. Concrete pads shall extend a minimum of 4" beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.
- E. Equipment attached directly to foundations or inertia bases; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation.
- F. Fill voids between baseplates and foundations, and level equipment, with grout.

3.12 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" requirements.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing and fire protection materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.13 GROUTING

- A. Mix and install grout for Fire Protection 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.

3.14 ACCESS DOORS – BUILDING

- A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.
- B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.15 FLASHING

- A. Provide flexible flashing and metal counterflashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.

3.16 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

- A. Equipment and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.
- B. At completion of all work, thoroughly clean exposed materials (pipe, etc.) and equipment and make ready for painting.

END SECTION 15453

SECTION 15455 - FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Pipe, Fittings, Valves for:
 - 1. Service from the water main to the building.
 - 2. Wet sprinkler system.

- B. System design and installation. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13 latest edition.
 - 1. Sprinkler Protection:
 - a. All sleeping, office, waiting areas, educational areas, dining areas, corridors, common areas: Light hazard, 0.10 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
 - b. Kitchen, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, Elevator Shafts (if required), Elevator Machine Rooms, Refrigeration Service Rooms, and storage between 100 and 250 sq. ft.: Ordinary Hazard, Group 1, 0.15 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
 - c. Storage rooms, storage rooms over 250 sq. ft., boiler plants, loading docks, and energy centers: Ordinary Group 2, 0.20 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.
 - d. Supply Areas with storage limit less than 12 ft. high: Ordinary Hazard Group 2. Storage height exceeding 12 ft., per NFPA 13 latest edition.
 - e. Provide sprinklers in accessible shafts per NFPA 13 latest edition.
 - 2. Add water allowance of 250 gpm for inside and outside hose streams to the sprinkler requirements at the connection to the distribution main.
 - 3. Hydraulic Calculations: The calculated demand including hose stream requirements shall fall no less than 10 percent below the available supply curve.
 - 4. Comply with IBC, NFPA 13, NFPA 30, Flammable and Combustible Liquid Code, NFPA 45, Standard on Fire Protection for Laboratory Using Chemicals, NFPA 54, National Fuel Gas Code, NFPA 58, Liquefied Petroleum Gas Code, NFPA 70, National Electric Code, NFPA 72, National Alarm and Signaling Code, and NFPA 101, Life Safety Code.

1.1 RELATED SECTIONS

- A. Section 15405 – Plumbing Identification.
- B. Section 15451 – General Fire Protection Requirements.
- C. Section 15453 – Basic Fire Protection Materials and Methods.

1.2 SYSTEM

- A. A wet sprinkler system providing coverage for the entire building courthouse and partial building fire station.
- B. Fire service from approximately 5ft outside the building to inside the building.

1.3 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Division 1, Section “Submittal Procedures” and the following:
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be furnished under Division 15.
 - 1. List shall be complete with manufacturer’s names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 - 2. Call attention to deviations from specified items as to operation and physical dimensions.
 - 3. Performance curves for equipment such as pumps shall be included.
 - 4. Final equipment orders shall not be placed until submittals have been returned marked “No Exceptions Noted” or “Make Corrections Noted”.
 - 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.
- C. Shop Drawings: (Wet Sprinkler)
 - 1. A reflected ceiling plan indicating locations of sprinkler heads, lights, HVAC devices, smoke detectors, exit lights and any additional items attached to ceiling. In lift out ceilings, sprinkler heads are to be centered in ceiling tiles. In hard ceilings, sprinkler heads to follow the general arrangement of the ceiling. After review by the Architect, revise layout as required.
 - 2. Prepare a working pipe shop drawing based on hydraulic calculations. The piping shop drawing shall indicate routing and configuration of piping, size of pipe, piping support, elevation of piping and coordination of piping with ductwork. Shop drawings shall include low point drain downs.

3. Hydraulic calculations are to be prepared utilizing a current water flow test (maximum 90 days old). If current flow test is not available, obtain a current flow test and pay for all fees required.
4. If water flow information is not available due to new main extension or other construction which prohibits the availability of flow information at the start of construction, the contractor shall estimate probable flow information based on information available. Once permanent water is available at the site, the Contractor shall perform a flow test, incorporate the information into the calculation and make any modifications to the system as may be required.
5. When drawings and hydraulic calculations are submitted to the Engineer for review, they shall bear the seals of Nicet Level 3 Designer, review and approval of the Architect, General Contractor and the Owners Insurance Underwriter. Note: Nicet designer shall be an employee of the Fire Protection Contractor.
6. The Contractor shall incorporate all comments for approval by local Fire Marshall's Office and any State of Alabama Reviewing Agency. Contractor shall provide signed, sealed and approved set of plans to Engineer upon approval by state and local authorities.

1.4 SYSTEM INSTALLATION AND INSPECTION

- A. Required Inspections:
 1. All underground and above ground fire line piping must be inspected by a Fire Inspector prior to being covered or concealed.
- B. Fire Stopping:
 1. All fire stopping of any and all fire rated assemblies must be inspected and approved by a Fire Inspector prior to the work being concealed.
- C. Hydrostatic Testing Requirements:
 1. The required hydrostatic testing of the underground and above ground fire line piping must be witnessed and approved by an Fire Inspector prior to being covered or concealed.
- D. Underground Fire Line Pipe Flush Test Requirements:
 1. The required flush test of the underground fire line piping must be witnessed by an Fire Inspector prior to being connected to the above ground piping or riser.
- E. Acceptance Inspections & Testing:
 1. Allow fire protection and life safety systems installation and acceptance test must be inspected, test, witnessed and approved by an Fire Inspector before the system can be accepted by the University.
- F. Plans Review & Approval:

1. All fire protection and life safety system drawings and specifications must be reviewed by this office to ensure code compliance prior to start of any work.

G. RMS Inspection Schedule Notification:

1. Provide a minimum one week notice of all inspections.

1.5 REGULATORY REQUIREMENTS

- A. Materials: Conform to UL and FM Global Requirements and Standards.
- B. Sprinkler System: Conform to NFPA 13, State of Alabama Fire Marshall Requirements and, City of Glencoe Fire and Rescue Requirements.
- C. Private Service Mains: Conform to NFPA 24.
- D. NFPA 25, Inspections, Testing and Maintenance of Water-Based Fire Protection Systems.
- E. NFPA 72, Standard for the Installation, Maintenance and Use of Protective Signaling Systems.
- F. NFPA 72E, Standard on Automatic Fire Detectors.
- G. NFPA 75, Standards for the Protection of Technology Equipment.
- H. Applicable Building Codes.
- I. Welding Materials and Procedures: Conform to ASME Code.
- J. Valves: Bear UL, FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- K. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.6 EXTRA MATERIALS

- A. Provide extra sprinklers under provisions of NFPA 13, State and Local requirements.
- B. Provide suitable wrenches for each sprinkler type.
- C. Provide metal storage cabinet in location designated. (Designate location).

PART 2 - PRODUCTS

2.1 PIPING BELOW GRADE AND BELOW SLAB ON GRADE

- A. Ductile Iron: Cement lined ANSI A-21.50.
- B. Joints on Ductile Iron: Standard mechanical joint ANSI A-21.11. Provide with retainer glands at all fittings and thrust blocks minimum 1 cubic yard of concrete at all changes of direction.

2.3 WET SPRINKLER SYSTEM

A. Wet System - Above Ground Piping:

1. Black Steel Pipe:

- a. All piping 1-1/2" and smaller, all piping larger than 1-1/2" with cut grooves on threaded and all welded piping, Schedule 40 black steel ASTM A53, ASTM A795, ASTM A135.
- b. Piping larger than 1-1/2" for roll grooving only, Schedule 10 ASTM A795, ASTM B36.10. Schedule 10 pipe may not be used for threading or cut grooving.
- c. Cast iron threaded fittings ANSI B16.4 cast iron flanges and flanged fittings ANSI B16.1.
- d. Malleable iron threaded fittings, ANSI B16.3.
- e. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts and washers; galvanized for galvanized pipe.
- f. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocket and O-ring, uniformly compressed into permanent mechanical engagement into pipe.
- g. Malleable Iron Fittings 175 lb. (250 lb.); ASME B16.3, threaded fittings.

2. Copper Tubing: ASTM B75; ASTM B88; Type K, hard drawn.

- a. Fittings: ASME B16.22, wrought copper and bronze, solder joint, pressure type.
- b. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

2. Copper Tubing: ASTM B75; ASTM B88; Type K, hard drawn.

- a. Fittings: ASME B16.22, wrought copper and bronze, solder joint, pressure type.
- b. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

3. All piping shall be pitched to drain down at low points. Low point shall be at sanitary drains at Mechanical Rooms only. Note: Unless approved by Owner / Engineer.

C. Sprinklers - Wet System:

1. Sprinklers to be UL approved glass bulb quick response type.
2. Suspended Ceiling (Layin and Gypsum):

- a. Manufactures:
 - 1) Viking Model M.
 - 2) Tyco, Reliable, Victaulic.
 - b. Type: Quick response concealed pendant type with painted cover plate.
 - c. Cover Plate: White. Unless indicated otherwise. Provide color chart to Architect for color selection.
 - d. Finish: Sprinkler Head – chrome plated.
 - e. Fusible Link: Glass bulb type temperature rated for specific area hazard.
4. Exposed Area Type:
- a. Manufactures:
 - 1) Viking Model M.
 - 2) Tyco, Reliable, Victaulic.
 - b. Type: Quick response upright type with guard.
 - c. Finish: Brass or chrome plated.
 - d. Fusible Link: Glass bulb type temperature rated for specific area hazard.
 - e. Guards: Finish to match sprinkler finish.
- D. Pipe Hangers and Supports:
- 1. Conform to NFPA 13.
 - 2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
 - 7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Plate Support: Carbon steel ring, adjustable, copper plated.
10. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for drop.

E. Gate Valves:

1. Up to and including 2 Inches:
 - a. Manufactures:
 - 1) Nibco Model T-104-O.
 - 2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
 - b. Bronze body, bronze trim 175 psi WP, UL Listed, rising stem, handwheel, solid wedge or disc, threaded ends.
2. Over 2 Inches:
 - a. Manufactures:
 - 1) Nibco Model F-607-OTS.
 - 2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
 - b. Iron body, bronze trim 175 psi WP, UL Listed, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

F. Butterfly Valves:

1. Cast or Ductile Iron Body
 - a. Manufactures:
 - 1) Nibco Model GD-4765-4/8.
 - 2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.
2. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper switch rated, UL / FM approved.

G. Check Valves:

1. Up to and including 2-1/2 inches to 6 inches:

a. Manufacturers:

1) Nibco Model G-917-W.

2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.

b. Iron body and swing disc, bronze seat, stainless steel spring, grooved ends, 175 psi WP.

2.4 EQUIPMENT

A. Water Flow Switch:

1. System sensor pressure activated detector. Potter, Viking, and Tyco are acceptable manufacturers.

B. Pressure Switch:

1. System sensor WFD water flow detector. Potter, Viking, and Tyco are acceptable manufacturers.

C. Supervisory Switches:

System sensor OSY2 Model tamper detector. Potter, Viking, and Tyco are acceptable manufacturers.

D. Test and Drain Assembly:

1. Viking Model A-1 complete with sight glass and 1/2" orifice for test purpose. Pipe discharge to drain riser on to exterior and spill on splash block.

Tyco, Victaulic, and Reliable are acceptable manufacturers.

E. Fire Department Siamese Connection:

1. Crocker Figure No. 6410-PC chrome plated exposed with clappers, caps and chains.
2. Location to be coordinate with Fire Chief and Architect.

Elkhart, Croker and Guardian Fire are acceptable manufacturers

F. Double Check Assembly: Ames C300 OS & Y double detector check valve.

G. Alarm Check Valve:

Viking J-1 Easy Riser Alarm Check Valve with Vertical Trim. Install complete with Trim Kit. Valve to have 300psi working Pressure. Viking, and Tyco are acceptable manufacturers.

2.5 FIRE STOP SYSTEMS

A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. listed assembly compatible with the rating of the wall or floor being penetrated.

- B. Non-rated walls – sheet rock joint compound may be used to seal opening.
- C. For piping passing through listed sheet rock walls or partitions:
 - 1. Uninsulated pipe passing through 2 hour walls or partitions – minimum 5/8" depth of Hilti FS 605 filling annular space between wall and pipe on both sides of wall. U.L. Listing #WL1056.
 - 2. Uninsulated pipe passing through 2 hour walls or partitions – minimum 1-1/4" depth of Hilti FS 601 filling annular space between pipe and wall on both sides of wall, U.L. Listing #WL1054.
- D. For piping passing through concrete floors, concrete walls or concrete block walls.
 - 1. Uninsulated Schedule 40 steel pipe; fill annular space between pipe and opening with Hilti #FS 605. U.L. Listing #CJ1184.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 24 for service mains.
- B. Connect to site fire service installed under another section. Verify the site with civil drawings for the exact size and location of the service prior to beginning work.
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforcement concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- H. Pipe Hanger and Supports:

1. Install in accordance with NFPA 13 and NFPA 14.
 2. Hangers on branch lines to comply with NFPA 13, 9.2.3.
 3. Hangers on mains to comply with NFPA 13, 9.2.4.
 4. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for a drop.
 5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 6. Where several pipes can be installed in parallel and at same elevation, provide multiple trapeze hangers may be used.
 7. Provide copper plated hangers and supports for copper piping.
 8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. cast inserts. The Contractor shall provide, layout, and install these inserts prior to placement of concrete.
- I. Slope piping and arrange systems to drain at low points.
- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating floors and wall. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- N. Die cut threaded joints with full cut standard taper pipe threads and connect with Teflon tape or Teflon pipe compound applied to male threads.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Provide valves for shut-off or isolating service and where shown on plans.
- Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- R. Install piping in attic directly on top of joists. Install plastic sheeting over top of pipe and secure joists. Insulation to be installed over pipe and plastic sheeting.



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END OF TABLE OF CONTENTS - HVAC

SECTION 15010 – GENERAL PROVISIONS-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. HVAC means Heating, Ventilation and Air Conditioning.
- B. Provisions of this Section apply to all HVAC and Control work.
- C. Include the provisions of General, Supplementary and Special Conditions and provisions of the Specifications shall apply to and form a part of this Section.
- D. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, except work specifically specified to be done or furnished under other sections of the Specifications. Include performing all operations in connection with the complete HVAC installation in strict accordance with the specification and applicable drawings subject to the terms and conditions of the Contract.
- E. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.
- F. "Provide" means to furnish and install, complete and ready for operation.
- G. All equipment shall be U.L. or E.T.L. Listed as an assembly.

1.02 DRAWINGS

- A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work. Coordinate with Architectural, Structural, Electrical, Plumbing and other Building Drawings.
- B. Follow the Drawings closely, check dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC Drawings for location of system components.
- C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work.
- D. Do not scale Drawings to locate ceiling diffusers. Coordinate with lighting, ceiling grids and/or reflected ceiling plans.

1.03 APPLICABLE CODES AND STANDARDS

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/ASHRAE 15 - Code for Building Services Piping.
 - 2. ANSI B9.1 - Safety Code for Mechanical Refrigeration.

3. NFPA 70 - National Electrical Code.
4. NFPA 90A - Air Conditioning and Ventilating Systems.
5. NFPA 91 - Blower and Exhaust Systems.
6. NFPA 101 - Life Safety Code.
7. NFPA 96 Commercial Cooking Equipment, Vapor Removal.
8. Other Standard as referenced in other Sections of Divisions 15.
9. Local Building Code (International Building Code if no local Building Code in effect).
10. Local Plumbing Code (International Plumbing Code if no local Plumbing Code in effect).
11. Local Gas Code (International Gas Code if no local Gas Code in effect).
12. Local Mechanical Code (International Mechanical Code if no local Code in effect).

1.04 QUALIFICATIONS OF SUBCONTRACTOR

- A. The HVAC Contractor shall meet the following qualifications:
1. The HVAC Contractor must be approved by the Architect.
 2. The HVAC Contractor shall have been in business as a HVAC Contractor for at least three (3) years prior to Bid Date.
 3. The HVAC Contractor shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project and have completed five projects of the same cost (or more) as the cost of this project, and for at least three (3) years prior to the Bid Date shall have had an established service department capable of providing service inspection or full maintenance contracts.
 4. Contractor must have bonding capacity for project of this size and must bond the project.

1.05 CONFLICTS AND INTERFERENCES

- A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.06 WORKMANSHIP

- A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.07 COOPERATION

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.08 VISITING SITE

- A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

PART 2 - PRODUCTS

2.01 MATERIALS, SUBSTITUTIONS AND SUBMITTALS

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Equipment and materials furnished shall be fabricated by manufacturer regularly engaged in their production and shall be the standard and current model for which replacement parts are available. HVAC equipment shall be substantially the same equipment of a given manufacturer which has been in successful commercial use and operation for at least three (3) years.
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the Bid, without substitution, and shall be furnished under the Contract unless requests for substitutions are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Substitutions will be considered only if written request for approval has been received by the Architect ten (10) days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which substitution is proposed, specification section/paragraph number and a complete description of the proposed substitute including drawings, cuts, performance and test data, samples and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.
- D. If the Architect approves any proposed substitution prior to receipt of Proposals, approval will be set forth in an Addendum. Do not rely upon approvals made in any other manner. Prior approval to be secured for "equal" or "approved equal" manufacturer.
- E. No substitutions will be considered after the Contract has been executed, except as described in the General Conditions.
- F. Submittal data and shop drawings, except controls, shall be submitted at one time, partial submittals will not be considered. Provide submittal in three (3) ring binders with tab sheets for each major item of equipment. Before ordering materials and equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Number of Shop Drawings and procedure shall be as directed by the Architect.

- G. Architect and / or Engineer's approval of submittal data does not relieve the contractor of his responsibility to comply with the contract documents.
- H. It is the responsibility of the Mechanical contractor to coordinate all Electrical requirements of the submitted equipment with the Electrical contractor. Any increase in cost due to a variance between the contract documents and the submitted equipment shall be the responsibility of the Mechanical Contractor.
- I. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.
- J. Similar items of equipment shall be the product of the same Manufacturer.
- K. See section, "ALTERNATES" in other section of the Specifications and Bid accordingly.

2.02 SHOP DRAWINGS

- A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn not less than 1/4"= 1'-0" scale. Submit one (1) set of paper or bond.
 - 1. Ductwork (do not scale diffuser locations, coordinate with ceiling grids and lighting layout). See Section 15860 "DUCT ACCESSORIES".
 - 2. Plenum casings.
 - 3. Complete mechanical equipment and fan room plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.
 - 4. Equipment piping.
- B. Submit complete control and power wiring diagrams for approval before installing controls. See Section 15900 "CONTROLS".

2.03 RECORD DRAWINGS

- A. When work starts, obtain white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.
- B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one (1) complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this Contract.
- C. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.
- D. When work is completed Contractor shall purchase from the Architect (At Architects' printing cost) one (1) set of mylar reproducible prints of HVAC Drawings for use in

preparing record drawings. Contractor shall transfer the information from the marked white prints to the mylar record drawings, removing all superseded data in order to show the actual completed conditions.

1. Accurately shown location, size and elevation of new exterior piping work and its relationship to any existing piping and utilities, obstructions, etc., contiguous to the area of work.
 2. Block out areas modified by change-order and identify them by change-order number.
- E. Ductwork and Control Drawings may be a set of mylar reproducible shop drawings, up-dated to show actual conditions at completion of work.

2.04 MOTORS, STARTERS AND ELECTRICAL EQUIPMENT:

- A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- B. Should the Contractor with the Architect's approval make changes in electrical equipment from those shown on the Electrical Drawings, he shall be responsible for the coordination and cost of required changes.
- C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.
- D. Motors:
 1. 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower three phase motors shall be of premium energy-efficient design with apparent efficiency (power factor X efficiency) not less than ASHRAE 90.1.
 2. All motors served by variable frequency drives (VFD's) shall be inverter duty rated.
 3. Unless shown otherwise motors less than 1/2 HP shall be single phase, motors 1/2 HP and larger shall be three phase.
 4. Allis-Chalmer, General Electric, Goulds, Louis Allis, and Westinghouse.
- E. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.
- F. Starters shall be in motor control centers, furnished mounted on packaged equipment or furnished in this section and installed under "ELECTRICAL SECTION" as indicated and/or shown on the Electrical Drawings. All starters furnished with fused control circuit transformers.
- G. Starters shall be equipped with melting alloy terminal overload protection, in a 3 phase. Starters, unless indicated otherwise, shall be across-the-line type with overload and low voltage protection. Starting equipment shall comply with local utility company requirements.

- H. Starters to be Square "D", Allen-Bradley, Cutler-Hammer or approved equal.
- I. For single phase motors provide manual starters equal to Square "D" Class 2510. When installed in equipment rooms provide surface mounted enclosure, and when installed in finished walls outside equipment rooms provide flush mounted enclosure, key operated.
- J. For three phase motors provide magnetic line voltage starters with NEMA I enclosures and melting alloy overload elements.
- K. Provide non-fused combination magnetic line voltage starters with NEMA I enclosures and melting alloy overload protection.
- L. Provide H-O-A switches, fused control circuit transformers, auxiliary contacts, etc., as shown on control diagrams or required by control sequences and/or arrange for these items to be furnished with the starters or motor control centers specified in Electrical Work.
- M. All starters shall be by the same manufacturer.
- N. Provide thermal overload with equipment for motors 1/2 HP and less at 120/1/60.

2.05 SLEEVES

- A. For pipe through floors inside rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1/2" larger than pipe or covering.
- B. For uninsulated pipe through fire rated walls or partitions or floors outside chases: Pipe Shields, Inc., Model WFB or approved equal at walls, Model DFB at floors.
- C. For insulated pipe passing through fire rated partitions or walls or floors outside chases: Pipe Shields, Inc., Model WFB-CS for hot lines, VFB-CS-CW for cold lines. Insulation: Calcium silicate for hot lines and foamglass for cold lines, thickness specified for adjacent pipe covering.
- D. For pipe through concrete beams: Schedule 40 black steel pipe, 1/2" larger than pipe or covering. Pipe covering passing through sleeve: calcium silicate in a 24 gauge galvanized steel shield similar to Pipe Shields, Inc. thermal hanger shield. Caulk space between bare pipe insulation jacket and beam with fire retardant rope at both ends of the sleeve and seal with 3M Brand fire barrier caulk CD 25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1".
- E. At Contractor's option, instead of the factory fabricated sleeves specified above for pipe passing through floors and fire rated walls and partitions substitute 20 gauge galvanized steel sleeve 1/2" larger in diameter than pipe or pipe covering and seal one end of sleeve (both ends if both ends are exposed) with 3M Branch Fire Barrier Caulk CP25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1". Where pipe is insulated, insulation shall be continuous thru sleeve, calcium silicate for hot lines and foamglass for cold lines. In exposed areas, after product has dried it shall be sanded smooth for painting under painting section.
- F. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.

- G. Sleeves for ducts: See Fire Dampers (See Section 15860 "DUCT ACCESSORIES").
- H. Extend sleeves 1-1/2" above finish floor and waterproof.
- I. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Fit closure plates snugly to duct and secure to wall. Grout around ducts and sound absorbers at equipment room walls.
- J. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

2.06 ACCESS DOORS

- A. Doors in non-fire rated walls and ceilings: 17-gauge steel with hinges and screwdriver latches, Bilco, Milcor, Miami-Carey, or equal. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance, minimum size 18" X 18".
- B. Mark lay-in ceilings with paper brads at maintenance access points. Bend ends of brads over above ceiling tile.

PART 3 - EXECUTION

3.01 PROTECTION OF ROTATING PARTS

- A. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.
- B. Provide exposed couplings with coupling guards.
- C. Equip propeller fans with guards.
- D. Equip inlets and outlets of open centrifugal fans with 1-1/2" #10 Diamond mesh galvanized steel screens.
- E. All motors or other equipment exposed to weather shall be provided with weatherproof covers.

3.02 PROTECTION OF EQUIPMENT

- A. During construction, protect mechanical equipment from damage or deterioration.
- B. When installation is complete, clean equipment and make ready for painting.
- C. During construction all ductwork, piping, and equipment shall be stored in a clean/dry location. Any ductwork or piping stored outside that is not protected shall be removed from the job site. Installed ductwork and piping shall have open ends covered at the end of each work day to prevent dust, dirt, and water from entering the ductwork and piping.

3.03 INSTALLATION OF EQUIPMENT

- A. Install equipment to provide normal service access to all components.

- B. Provide sufficient space for removing components, install equipment to provide such clearance.
- C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All equipment shall be firmly fastened in place:
 - 1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.
 - 2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.
 - 3. Vibration isolators shall be secured to floors, pads or structure and equipment shall be bolted to the isolators.

3.04 EQUIPMENT SUPPORTS

- A. Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors.
- B. Set all floor-mounted equipment, other than condensate pumps, on concrete pads or rails (as indicated of height shown, but not less than 4" high). Coordinate pad height with condensate drain trap requirements. Chamfer rails and pads 1". Where shown, provide reinforced floating pads mounted on vibration isolators. Form, reinforce and pour any pads and rails required but not shown on Structural and Architectural Drawings.

3.05 CUTTING AND PATCHING

- A. Set sleeves and inserts and lay-out and form openings in walls, beams, girders and structural floors in this Section.
- B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

3.06 INCIDENTAL WORK

- A. Provide all motors incidental to the Mechanical Systems. Wiring of motors, switches and starters is included in "ELECTRICAL SECTIONS".
- B. Do all control wiring required for Mechanical work.
- C. Provide motor starters as specified above.
- D. Submit refrigerant piping diagrams as prepared by the HVAC Contractor and/or refrigeration equipment manufacturer for approval.
- E. Final water connections to services are included in this Section.
- F. Permanent drain connections for AC units, etc., and auto air vents to nearest floor drain

are included in this Section.

- G. Door louvers are not included in this Section.
- H. Items obviously omitted from drawings and/or specifications shall be called to attention of the Architect prior to submitting Bid, after award of Contract any changes or rearrangements necessary to complete Contract shall be at no additional cost to Owner.
- I. All return air and exhaust air grilles shall be covered with filter media if they are started and operated during construction.

3.07 FLASHING

- A. General: Furnish all fans curbs, pitch cups, metal base flashing and counter flashing required for HVAC Work. Installation of above items is specified in "ROOFING SECTION" with coordination by HVAC Contractor.
- B. Fan curbs for power roof ventilators are specified with the fans.
- C. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.
- D. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel duct and aluminum for aluminum duct. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.
- E. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

3.08 EXCAVATION AND BACKFILLING

- A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.
- B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. Do not use piers to support piping.
- C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas with "Engineered Fill", sand or fine gravel in accordance with requirements of "Sitework". Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.

3.09 DEMOLITION:

- A. Certain existing HVAC equipment to be removed and/or relocated as shown or noted. Equipment removed will remain the property of the Owner unless designated otherwise. Remove from the premises all items not retained by the Owner.

3.10 HVAC INSTALLATION OF AND CONNECTIONS TO ITEMS FURNISHED BY OTHERS
OR SPECIFIED IN OTHER SECTIONS

- A. Duct Mounted Smoke Detectors: Install in duct.
- B. Domestic Water Heaters: Provide gas flues and combustion air vents.

3.11 PAINTING

- A. Refinish equipment damaged during construction to new condition.
- B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.
- C. Paint un-insulated duct surfaces visible through grilles and registers flat black.
- D. Other painting is specified in "PAINTING SECTION, Finishes Division".

3.12 PIPE IDENTIFICATIONS

- A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.
- B. Submit samples of all labels, tags, stencils, chains, etc., for approval.
- C. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.
- D. Label Spacing and Extent:
 - 1. On straight run of pipes; Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
 - 2. Wherever a pipe enters or leaves a room or building.
 - 3. At change of direction.
 - 4. At main valves and control valves (not equipment valves).
 - 5. On risers, just above and below floors.

3.13 EQUIPMENT IDENTIFICATIONS

- A. Provide 2" X 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tags, leaving lower half of tag for future engraving by Owner.
- B. Provide similar nameplates for motor starters furnished under this section.
- C. Secure nameplates with acorn head screws.

- D. Colors:
 - 1. Equipment connected to utility power only - black letters on white nameplates.
 - 2. Equipment connected to emergency power - red letters on white nameplates.
- E. In existing building replace all existing nameplates which do not comply with above colors.

3.14 EXHAUST FAN IDENTIFICATIONS

- A. 2" X 3" or larger laminated plastic nameplates with red letters and numbers on white background, identifying type of fans, number according to plans, and rooms served. Engrave on upper half of tag, leaving lower half for engraving by Owner. Fasten with acorn head screws.

3.15 ACCESS DOORS

- A. Provide access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-lift-out ceilings or behind partitions or walls.

3.16 USE OF HVAC SYSTEM DURING CONSTRUCTION

- A. Ducted HVAC systems may be used during construction as long as the following conditions are met:
 - 1. All AC units shall have filters installed in the AC units that are equal to the filters that are scheduled for each piece of equipment. The contractor shall be responsible for changing the filters in all AC units during construction at a minimum of every 30 days starting from the day the AC units are started. At the completion of the project, the contractor shall replace all filters.
 - 2. All return air and outside air openings shall be protected with temporary filter media. The temporary filter media shall be changed by the contractor. Temporary filter media is required to protect the installed ductwork. During or after construction, if any ductwork is observed without temporary filter media, the contractor shall be solely responsible for cleaning the entire ductwork system and AC unit. Temporary filter media shall be changed bi-weekly at a minimum.
 - 3. All AC units shall have all correct motor overload elements installed and all safeties shall be wired and operational prior to temporary use of the AC unit.
 - 4. Temporary controls and temporary control sequences may be utilized by the contractor until the permanent controls and control sequences are installed. Temporary control methods shall be the sole responsibility of the contractor.
 - 5. All AC units required to have factory start-up shall have factory start-up completed prior to use.
 - 6. The building envelope for the area served by the AC units shall be substantially complete prior to using the AC units during construction.
- B. Ductless split systems shall NOT be used during construction. Protect all indoor sections

of ductless split systems during construction to prevent dust, dirt, or water from entering the unit.

3.17 WARRANTY AND INSTRUCTIONS

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one (1) year after date of substantial completion of the Contract. Should any defects in materials, workmanship, or equipment be made known to Contractor within the one (1) year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. All centrifugal, reciprocating, screw or scroll type refrigeration compressors shall bear five (5) year non-pro-rated parts warranty.
- D. All gas fired air furnaces shall bear ten (10) year prorated heat exchanger warranties.
- E. After completion of the work, Contractor shall operate the equipment which he installs for a period of ten (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment. Furnish necessary oral and written operating instructions to the Owner's representative.
- F. Provide five (5) sets of manufacturer's operating and maintenance manuals and parts lists including nearest manufacturer's sales and service representative by name, address and phone for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency. Include all warranty dates on equipment and guarantees. Include names, address and phone of any subcontractor and work performed. Bind above items in loose leaf three (3) ring binders with tab for each class of equipment.
- G. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- H. Supply initial charges of refrigerant, refrigeration lubricating oil; and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.
- I. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.
 - 1. Service shall include:
 - a. On call nuisance issues.
 - b. Replenishing refrigerant and antifreeze if loss occurs due to system failure.
 - 2. Service shall not include:
 - a. Routine maintenance of the equipment unless specified in specific

equipment specification section(s).

3.18 PROJECT CLOSE-OUT DOCUMENTS

- A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
1. A letter signed by the subcontractors for HVAC, Electrical, and Temperature Control work stating that they have jointly checked each power circuit and control circuit and mutually agrees that controls and power circuits will function properly.
 2. Record drawings - sheet metal work (reproducible).
 3. Air balance report (3).
 4. Equipment Submittal Data (3).
 5. Equipment operating and maintenance manuals (3).
 6. Maintenance schedule (3).
 7. Equipment warranty dates and guarantees (3).
 8. List of Owner's Personnel who have received maintenance instructions.

END OF SECTION 15010

SECTION 15020 – TESTING, BALANCING AND ADJUSTING (TBA)

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this section apply to all HVAC work.
- B. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 48 hour notice is required prior to performance of test.
- C. Provide complete report to Engineer for approval TEN (10) working days prior to Engineer's final site visit.

1.02 QUALIFICATIONS

- A. All TBA work shall be performed by an independent Test and Balance Agency specializing in Testing, Balancing and Adjusting of HVAC Systems.
- B. All TBA work shall be under supervision of a qualified registered professional engineer regularly engaged in the TBA Agency.
- C. TBA Agency shall be an AABC or NEEB Member and/or shall obtain written approval from the Architect prior to Bidding.

1.03 APPROVAL

- A. Application for approval of the TBA agency shall be submitted prior to Bid.
- B. Submittal information regarding the TBA agency to include:
 - 1. List of at least five (5) projects successfully completed of similar size and scope.
 - 2. Copy of reporting forms to be used for this project indicating scope of TBA work.
 - 3. Name of registered engineer in charge with resume of qualifications. List of personnel that will perform TBA work on project and qualifications.
 - 4. List of instruments to be used with dates of latest calibrations.
 - 5. List of memberships in AABC, NEBB or other similar organizations.

PART 2 - PRODUCTS

2.01 INSTRUMENTS

- A. All instruments used for the TBA work shall be calibrated within six (6) months and checked for accuracy prior to start of work.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Prior to any work beginning perform, a pre-demolition test of all existing systems being affected by the renovation and/or the addition. Submit Test and Deficiency List as indicated below.
- B. After HVAC system has been installed, Test, Balance and Adjust System for proper operation, air distribution, flow rates, temperatures and humidities. Correct any noise and/or vibration conditions.
- C. Include a "Deficiency List" with the TBA air and water balance report. Deficiency list shall include TBA items which are not in accordance with Contract Documents.
- D. Perform all tests as required by local codes. Contractor shall furnish testing equipment.
- E. If local Codes are more stringent, local Codes shall govern.

3.02 AIR SYSTEM

- A. When system has been completed, remove all trash and dirt, set grille bars and diffuser patterns for required throws and adjust and balance air duct systems so air quantities at outlets are as directed and distribution from each supply outlet is free from drafts and excessive noise, and uniform over the face of each outlet. Do all testing and balancing with filters blanked to provide pressure drops midway between clean condition and manufacturer's recommended change-out condition. Balance air quantities to within 10% of indicated air quantities.
- B. Make adjustments so dampers and volume adjusters close to air outlets will have the least pressure drop consistent with volume requirements. Obtain additional pressure drop required for balancing of shorter runs by adjusting dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Change sheaves and belts as required to adjust AC units to proper airflow.
- C. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but measure air quantities in ducts having velocities of 1000 feet per minute or more with pitot tubes. Cap pitot tube openings in low pressure ducts with plastic plugs. Cap pitot tube openings in medium and high pressure ducts and kitchen and laboratory exhaust ducts with Duro-Dyne test ports.
- D. Permanently mark settings of dampers and other volume adjusting devices so they can be restored if disturbed.
- E. When air balancing has been completed, submit to Architect an air balance log, including design and actual air quantities, pressures, etc., in each branch duct and at each grille, register, and outlet. Individual outlet air rates are required for boots on boot-box systems.
- F. Include for each system the following information:
 - 1. Fan rpm, motor amps, motor nameplate amps, and amp rating of starter heater.

2. Total air quantity supplied by each system and/or fan.
3. Total outside air quantity supplied by each system.
4. Provide velocity pressure across each duct mounted smoke detector and list manufacturer's required velocity pressure range.
5. Air flow at all grilles.

3.03 COILS

- A. Provide the following:
 1. Entering and leaving air temperatures.
 2. Outside air temperature at time of test.
 3. Air pressure drop.

3.04 START-UP AND SERVICE

- A. At the beginning of the first heating season, adjust and balance operating phases and repeat at the beginning of the first cooling season or vice-versa, as the case may be, all without charge.
- B. The Contractor and Factory Representative of the boilers, chillers, AC units and major HVAC equipment shall place every item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period. Adjustment services does not include lubricating fans or motors and does not include changing filters or adjusting belts.
- C. In addition, submit equipment manufacturers' start-up reports for items listed above. See "Project Close-Out".

END OF SECTION 15020

SECTION 15050 – MATERIALS AND METHODS-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Include Section 15010, "GENERAL PROVISIONS - HVAC", with this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All pipe, fittings and valves shall be manufactured in the United States of America.

2.02 HVAC DRAIN PIPING

- A. Standard weight galvanized steel pipe ASTM A-120 with galvanized malleable iron fittings, or type "L" hard copper with wrought copper sweat fittings or Schedule 40 PVC, at Contractor's option.
- B. Provide drain traps for AC Unit drain pans. Size traps as required to drain under operating conditions.

2.03 REFRIGERATION PIPING

- A. ACR hard drawn copper tubing with wrought copper sweat fittings. Joints: Silfossed with continuous flow of dry nitrogen through lines.
- B. Size suction and discharge lines so as to insure oil return at minimum loading.
- C. Small lines 5/8" OD and smaller may be soft copper with flare fittings, provided that all joints are exposed for visual inspection.
- D. Refrigerant piping shall be sized and installed as recommended by the equipment manufacturer. Provide lift traps or double suction risers as required for oil return.

2.04 PIPE HANGERS

- A. General: Pipe hangers, Grinnell, PHD, Michigan Hanger, or Elcen. Grinnell figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines. Provide stainless steel or plastic coated hangers in Pool areas subject to chlorine atmosphere.
- B. Pipe hangers for lines 3" and smaller (other than steam and condensate lines), adjustable wrought ring hangers, Grinnell Fig. 97 or wrought clevis hangers, Grinnell Fig. 260.
- C. Pipe hangers for lines 4" and larger (other than steam and condensate lines), adjustable wrought ring hangers, Grinnell Fig. 260.
- D. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at

least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.

- E. Beam Clamps: Grinnell Fig. 229.
- F. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Grinnell Fig. 282.
- G. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (power driven anchors are not acceptable).
- H. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8" and 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.
- I. Space pipe hangers at maximum: Pipe hanger spacing for screwed, solder joint and welded piping: 1/2", 6 ft.; 3/4" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3", 12 ft.; 4", 14 ft.; 5", 12 ft. 6", 10 ft., 8" and over, 6 ft. Polypropylene and PVC plastic pipe 4 ft. horizontally maximum or as directed by manufacturer if closer, and 10 ft. vertically. Install additional hangers at change of direction and valve clusters.
- J. Install pipe hangers on insulated pipe (other than steam and condensate lines) over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" at hangers. Provide shield insulation of waterproofed calcium silicate for hot water piping and foamglass for chilled water piping, same thickness as adjacent pipe covering. At Contractor's option, pipe shields may be field fabricated using waterproof calcium silicate or foam glass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".
- K. Wrap bare copper refrigerant lines with sheet lead at hangers.

2.05 THERMOMETERS AND GAUGES

- A. Mercury in glass red reading separable socket industrial thermometers with die cast metal or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Trerice, Weksler, Marsh or equal. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or long enough to permit unions to clear insulation whichever is greater.
- B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.
- C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.
- D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourbon tubes, 316 stainless steel or brass movement, non-ferrous or phenolic solid front cases, and accuracy not less than 1% of full scale over the entire range. Gauges shall be Ashcroft, Trerice, Weksler, U.S., Marsh or equal. Gauge with minimum bourbon tube diameter of 3". Provide brass or stainless bar stock needle valves for all pressure gauges. Provide siphons for steam gages.
- E. Where shown, provide temperature and pressure measurement plugs and caps, equal to

Peteron Equipment Co., Inc. "Pete's plug with Nordel seats and seals", flow design or approved equal. Provide one Pressure and Temperature Kit consisting of 0-100 psi pressure gauge with adapters, two (2) thermometers (25E - 125E F and 0E - 220E F), all in carrying cases.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxyacetylene welding. Provide full perimeter welds at both face end and collar end of each slip-on flange.
- C. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid spring of pipes during assembly.
- D. Pitch air conditioning unit drain lines down in direction of flow 1" in 20'.
- E. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.
- F. Install 3/4" ball or gate valve drains with hose adapters at low points of water piping and at bases of all risers or where shown provide large drains.
- G. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide rubber grommets at pipe penetrations to equipment casings.
- H. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulation unions or couplings, equal to EPCO.
- I. Near heating and air conditioning equipment requiring water valved and capped water outlets of sizes shown, for connection to equipment, including reduced pressure principal backflow preventers shall be provided. Make final connections under HVAC work. Note that all piping and insulation downstream of backflow preventer must be painted yellow.
- J. Run piping concealed, except where specifically shown or specified exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise. All piping shall be run as high as practical and not on the floor unless otherwise indicated.

3.02 REFRIGERATION SYSTEM

- A. Split Systems: When system is complete, but before the pipe covering has been installed, test components with dry nitrogen and make tight at equipment manufacturer's

recommended test pressures. Then evacuate the system to 26" Hg. vacuum which the system shall hold for 24 hours. After passing the above tests, charge and leak test under operating conditions using electronic leak detector.

- B. Split and Packaged Systems: Check operation of refrigeration cycle and report head pressure, suction pressure and oil pressure.

END OF SECTION 15050

SECTION 15080 – PIPING SPECIALTIES-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this section apply to all HVAC work.

PART 2 - PRODUCTS

2.01 SPECIALTIES - REFRIGERANT

- A. Install molded desiccant core filter dryer in each liquid line. Provide throw away dryers for lines 1/2" and smaller. Provide replaceable core dryers for lines 5/8" and larger. Dryers shall be Sporlan "Catchall".
- B. Install moisture indicating sight glass in each liquid line.
- C. Service valves: Wing cap valves, Henry, or approved equal.
- D. Expansion valves: Thermostatic valves with external equalizers, Sporlan, or approved equal.
- E. Install solenoid valve in each liquid and hot gas bypass line. Hot gas solenoid valve shall be equipped with a high temperature coil.
- F. Install suction line accumulators in all outdoor heat pumps and condensing units where refrigerant lines exceed 85' in length, or where recommended by manufacturer.
- G. Refrigerant circuit access ports located outdoors shall be fitted with locking-type, tamper-resistant caps. Provide owner with any tools necessary to un-lock the caps.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Specialties shall be installed in accordance with manufacturer's recommendations.
- B. See Details for mounting instructions and accessories.

END OF SECTION 15080

SECTION 15180 – INSULATION-HVAC

PART 1 - GENERAL

1.01 SCOPE

- A. Include Section 15010 "GENERAL PROVISIONS - HVAC", with this Section.
- B. Repair existing insulation at points of connection to existing work.
- C. "Exposed" is defined as: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".
- D. "Attic" is defined as any ceiling space that is adjacent to the roof.
- E. Insulate all items subject to sweating or loss of heat.
- F. All insulation shall be installed by licensed applicator and applied in accordance with the Manufacturer's Recommendations.

1.02 INSULATION REQUIREMENTS

- A. Comply with NFPA 90A.
- B. Pipe hanger shields are specified in Section 15050 "MATERIALS AND METHODS - HVAC".
- C. Use insulation and adhesives with Underwriter's Laboratories flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding 50 for all other pipe, duct and equipment insulation.

PART 2 - PRODUCTS

2.01 FOAM PLASTIC PIPE COVERING

- A. Fire retardant foamed plastic pipe covering, maximum K factory at 75EF mean temperature not exceeding 0.27 BTU/(hr) (sq. ft.) (EF/in). Armstrong "Armaflex II", or approved equal.
- B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.
- C. Make fitting covers from segments of pipe covering.
- D. Cement all joints and seams in accordance with manufacturer's instruction using Armstrong 520 adhesive.
- E. Fit pipe hangers over insulation (See PIPE HANGERS). Use hanger shields as specified under pipe hangers.
- F. Thermal performance shall be as follows:
 - 1. 1" thick: R=4.2.
 - 2. 2" thick: R=8.0.

2.02 ALUMINUM JACKET PIPING COVER

- A. 0.010" thick corrugated aluminum jacket with laminated polyethylene and draft paper adhered liner.
- B. Securely rivet jacket in place and band with flat aluminum bands 18" o.c.
- C. Finish fittings on aluminum jacketed lines with 1/8" thick (dry) coat of vinyl acrylic mastic reinforced with glass cloth.

2.03 DUCT INSULATION, INTERNAL

- A. Glass fiber acoustical/thermal insulation complying with NFPA 90A and UL 181 and having an erosion resistant anti-microbial membrane equal to Johns Manville, Linacoustic ARC@ on the air side. Edge coating shall be factory applied to the edges of the liner core. Shop fabrication cuts and field cuts or tears shall be coated with Superseal Duct Butter. NRC (1" thick) not less than 0.70, minimum density 3 lb/cu. ft., and maximum friction correction factor at 2000 fpm average velocity 1.15 (per TIMA test method AHS-1S2-76U). Thermal performance shall be as follows:
 - 1. 1" thick: R=4.2.
 - 2. 1 1/2" thick: R=6.3.
 - 3. 2" thick: R=8.0.

2.04 DUCT INSULATION, EXTERNAL FOR CONCEALED

- A. Formaldehyde free flexible glass fiber insulation with foil-scrim-craft (FSK) facing equal to Johnson Manville Micro-Lite AXG@. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 3/4 lb./cu. ft., 3" thickness, installed R=8.3 minimum.

2.05 DUCT INSULATION, EXTERNAL FOR EXPOSED OUTDOOR DUCTS

- A. 6 lb/cu. ft. fiberglass board with FSK facing and thermal conductivity not exceeding 0.22 BTU/(hr) (sq. ft.) (°F/in.) at 75°F mean temperature. Finish with glass cloth embedded in vinyl acrylic mastic and aluminum jacket.

2.06 COMMERCIAL KITCHEN GREASE AND AIR VENTILATION 2-HR. RATED FIRE WRAP EQUAL TO FIRE MASTER.

PART 3 - EXECUTION

3.01 HVAC PIPING INSULATION

- A. Refrigerant Suction Lines and Hot Gas Bypass Lines: "Foam Plastic Pipe Covering", 1" thick. Jacket piping located outdoors or exposed to view with aluminum jacket.
- B. AC Unit Drain Lines: "Foam Plastic Covering", 3/4" thick. Jacket piping exposed to view with aluminum jacket.

3.02 AIR TERMINAL DEVICES

- A. Ceiling Mounted Supply Diffusers: 3" thick duct insulation on back of diffuser, external for concealed.
- B. Fire Dampers for Internally Lined Ducts and Externally Insulated Ducts: 3" thick duct insulation on all sides, external for concealed.

3.03 DUCT INSULATION INTERNAL (AND EXTERNAL WHERE INDICATED)

- A. Apply in accordance with SMACNA "Duct Liner Application Standard" over full coverage adhesive. Coat all edges with adhesive and seal all punctures or tears with mastic before installing ducts. Cut liner to assure overlapped and compressed longitudinal corner joints. Fasteners shall be sized appropriately for thickness of liner utilized. Provide mechanical fasteners and metal nosings as noted below:
 - 1. For all velocities, provide metal nosings on upstream edge of liner at connections to equipment: Fans, coils, dampers, AC Units, sound absorbers, etc.
 - 2. For velocities up to 2,000 feet per minute: Start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 12" o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere locate fasteners a maximum of 18" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break.
 - 3. For velocities from 2,001 to 4,000 feet per minute: Start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 6" o.c. around the perimeter of the duct, except that they may be a maximum of 6" from a corner break. Elsewhere locate fasteners a maximum of 16" o.c., except that they shall be placed not more than 6" from a longitudinal joints of the liner nor more than 12" from a corner break. In addition to the adhesive edge coating of transverse joints, coat and longitudinal joints with adhesive.
 - 4. For velocities from 4,001 to 6,000 feet per minute: Same as 2 above except that metal nosing shall be installed to secure liner at all upstream transverse edges.
 - 5. Where ducts are listed to be lined and wrapped, install wrap per section below "Duct Insulation, External, for Concealed Ducts"
- B. Thickness and Extent:
 - 1. Return Ductwork: 1" thick
 - 1. Supply Ductwork where shown: 1" thick

3.04 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS

- A. Adhere insulation to duct surface with approved adhesive applied in strips above 6" wide on approximately 12" centers. Flare door staples may be used for securing the insulation until the adhesive sets. Lap jacket and vapor seal all joints and seams with suitable

mastic.

- B. On rectangular and flat oval ducts 30" wide and wider, additionally support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.

- C. Thickness and Extent:

1. Supply, exhaust and outside air ductwork located in ceiling space where not called to be lined: 2.33" thick.
2. Supply, exhaust and outside air ductwork located in attic space where not called to be lined: 3" thick.
2. Return air ductwork located in attic (wrapped and lined): 3" thick.

NOTE: Conical and straight spin-ins on both lined and unlined ducts shall be insulated. Insulation shall be slit at damper rods, at spin-ins and sealed vapor tight.

3.05 DUCT INSULATION, EXTERNAL, FOR OUTSIDE DUCTS:

- A. Insulate all exposed supply and return ducts with 2" thick 6 #/cu. ft. fiberglass board with FSK jacket in addition to the insulation specified above. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic. Finish with aluminum jacket, 26 gauge, slope so rain will not stand on duct.
- B. Cover all angles, seams and joint reinforcing with insulation and seal vapor tight.

3.06 INSULATION WETTED DURING CONSTRUCTION

- A. Contractor shall replace any and all insulation wetted during construction at his own expense.

END OF SECTION 15180

SECTION 15205 - AIR PURIFICATION SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

- 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 or mounted on the duct as shown on the plans, details and equipment schedules.

1.02 REFERENCED CODES & STANDARDS:

- A. The following codes and standards are referenced through out. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.

- 1. ASHRAE Standards 62 & 52
- 2. National Electric Code NFPA 70
- 3. UL 867 including ozone chamber test required as of December 21, 2007

1.03 RELATED WORK:

- 1. Testing, Adjusting and Balancing
- 2. Facility Access and Protection
- 3. Ductwork
- 4. Filters
- 5. Water and Refrigerant Piping
- 6. Electrical Wiring
- 7. Control Wiring

1.04 QUALITY ASSURANCE:

- A. Basis of design is Top Product Innovations. Global Plasma Solutions and Phenomenal Aire shall be considered equal subject to meeting all specifications herein.
- B. The Air Purification System shall be a product of an established manufacturer within the USA.

- C. 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.
- D. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable.
- E. Projects designed using ASHRAE Standard 62, IAQ Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2013 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted.
- F. The Air Purification System have been tested by UL or Intertek/ETL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers shall submit their independent UL 867 test data with ozone results to the engineer during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.
- G. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.007 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.0042 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

1.05 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data for ion generators including:
 - 1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
 - 2. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
 - 3. Performance data for each type of plasma device furnished.
 - 4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2013 to validate acceptable indoor air quality at the quantity of outside air scheduled (when projects are designed with outside air reduction).
 - 5. Product drawings detailing all physical, electrical and control requirements.

6. Copy of UL 867 independent ozone test.

B. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.

B. Store in original cartons and protect from weather and construction work traffic.

C. Store indoors and in accordance with the manufacturers' recommendation for storage.

1.07 WARRANTY:

A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twenty-four months after shipment, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

PART 2 - PRODUCTS

2.01 GENERAL:

A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.

B. Basis of Design: Top Product Innovations Type C unit

C. All other Suppliers of comparable products requesting prior approval shall:

1. Submit for prior approval in accordance with the requirements of Section 15010.

2. In addition, manufacturers submitting for prior approval for Bi-Polar Ionization must as part of the prior approval request provide their ASHRAE 62.1-2013 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. A third party validation study performed on a previous installation of the same application shall also be included.

3. Submit independent test data from ETL or UL showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.

2.02 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA"

- A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.
- B. The Bi-polar Ionization system shall be capable of:
 - 1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
 - 2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
 - 3. Capable of reducing static space charges.
 - 4. Increasing the interior ion levels, both positive and negative, to a minimum of 800 ions/cm³ measured 5 feet from the floor.
- C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable.
 - 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.
 - 2. Velocity Profile: The air purification device shall not have maximum velocity profile.
- D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.
- E. Equipment Requirements:
 - 1. Electrode Specifications (Bi-polar Ionization):
 - a. Each Plasma Generator with Bi-polar Ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Unit shall be capable of treating 6,000 CFM (C6.0) or 10,000 CFM (C10.0). Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion.
 - b. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time.

- c. Electrode pair shall provide a minimum of 140 million ions per cubic centimeter (C6.0) or 200 million ions per cubic centimeter (C10.0), both positive and negative ions in equal quantities. Devices providing less than the rated ion densities shall not be acceptable.

F. Air Handler Mounted Units:

- 1. Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with an integral illuminated LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per AHU is required to interface to the BAS or the optional DDC controller. Dry contacts proving power has been applied in lieu of the ion output is actually operating, are not acceptable.

- G. Plenum/Duct Mounted Units: Where so indicated on the plans and/or schedules, Plasma Generators(s) shall be supplied and installed. The generator shall be installed through the duct wall and into the air stream with the external power head in a convenient location for visual indication of power, removal and servicing, by the mechanical contractor. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per duct is required to interface to the BAS or the optional DDC controller.

H. Ionization Requirements:

- 1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.
 - a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed and powered by 24VAC.
 - b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.
 - c. Ionization output from each electrode shall be a minimum of 140 million ions/cc (C6.0) and 200 million ions/cc (C10.0) when tested at 1" from the ionization generator.
 - d. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:

- A. MRSA - >96% in 30 minutes or less

- B. E.coli - > 99% in 15 minutes or less
 - C. TB - > 69% in 60 minutes or less
 - D. C. diff - >86% in 30 minutes or less
 - 1. Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable.
 - 2. Ozone Generation:
The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.
- I. Electrical Requirements:
- 1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.
- J. Control Requirements:
- 1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset.
 - 2. Integral airflow sensing shall modulate the Plasma output as the air flow varies or stops. A mechanical air flow switch shall not be acceptable as a means to activate the Plasma device due to high failure rates and possible pressure reversal.
 - 3. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
 - 4. All Plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the Plasma device, but not directly sensing the power at the ion output, shall not be acceptable.
 - 5. Plasma systems that use multiple modules with ion output alarm wires wired to the same terminal such that all ion modules must fail to show an alarm status shall not be acceptable.

PART 3 - EXECUTION

3.01 GENERAL:

- A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.02 ASSEMBLY & ERECTION: PLASMA GENERATOR WITH BI-POLAR IONIZATION:

- A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.
- B. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.
- C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.03 TESTING:

- A. Provide the manufacturers recommended electrical tests.

3.04 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.

END OF SECTION

SECTION 15670 – CONDENSING UNITS

PART 1 – GENERAL

1.01 SCOPE:

- A. Provisions of this section apply to all HVAC work.

2.00 PRODUCTS:

2.01 CONDENSING UNITS - AIR COOLED:

- A. Include one or more reciprocating compressor(s), condenser and condenser fan, all enclosed in a single casing. Provide separate refrigerant circuit for each compressor.
- B. Casing: Aluminum or galvanized steel designed for outdoor installation. Galvanized steel casings shall be furnished with enamel over bonderizing. Equip casings with access panels, condenser inlet guards and fan outlet guards. Provide padlock connections for power and control access panels.
- C. Compressors: Welded or bolted hermetic compressors, spring isolated, with reversible oil pumps and steps of unloading, actuated by suction pressure.
- D. Condenser: Aluminum fins securely bonded to seamless copper tubes. Condenser Fans: Direct driven propeller fans, resiliently mounted, with weather protected fan motors.
- E. Provide (liquid receiver if condenser coil will not contain entire system charge where 80% full at 100°F.) suction and discharge service valves and liquid stop valve.
- F. Controls: Factory wired and located in a readily accessible location. Provide (2 step) line voltage contactor and both temperature and current sensitive overload devices for compressor motor, cycle timer to limit compressor starts to 5 or 6 minute intervals, oil pressure switch, high and low pressure switches and crankcase heater. Provide low-ambient-start devices and flooding or variable air volume head pressure controls for stable starting and operation in ambient temperature of 10°F. Fan cycling head pressure controls are not acceptable.
- G. Mount condensing units on roof on support or on grade on poured in place pad as shown.
- H. Provide five (5) years non-prorated compressor parts warranty.
- I. Manufactured by Trane, Carrier, JCI or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Condensing unit shall be installed in accordance with manufacturer's recommendations.

END OF SECTION 15670

SECTION 15760-HEAT PUMP UNITS

PART 1 - GENERAL

1.01 SCOPE:

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 HEAT PUMP - (MINI-SPLIT):

- A. The Heat Pump system shall be a Mitsubishi Electric, Trane, Daikin, Samsung or approved equal split system with Variable Speed Inverter Compressor technology. The system shall consist of a ceiling-suspended or wall mounted indoor section with wired, wall mounted controller and a horizontal discharge, single phase outdoor unit.
- B. Quality Assurance
1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
 2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
 3. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.
 4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
 5. A dry air holding charge shall be provided in the indoor section.
 6. The outdoor unit shall be pre-charged with R-410a refrigerant.
 7. System efficiency shall meet or exceed 13.0 SEER.
- C. Delivery, Storage and Handling
1. Unit shall be stored and handled according to the manufacturer's recommendations.
 2. The wireless controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.
- D. Warranty
1. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. The compressor shall have a warranty of 6 years from date of installation. If, during this period, any

part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

2. Manufacturer shall have over 25 years of continuous experience in the U.S. market.

E. Performance

1. Each system shall perform in accordance to the ratings shown in the table below.
Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit. Heating performance shall be based on 70°F DB, 60°F WB (21.1°C DB, 15.6°C WB) for the indoor unit and 47°F DB, 15°F WB (8.3°C DB, 6.1°C WB) for the outdoor unit.

F. Indoor Unit

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.
2. Unit Cabinet

The casing shall be ABS plastic and have a Munsell 0.70Y 8.59/0.97 finish. Cabinet shall be designed for suspension mounting and horizontal operation. The rear cabinet panel shall have provisions for a field installed filtered outside air intake connection.
3. Fan

The evaporator fan shall have three high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of four (4) speeds: Low, M1, M2, and Hi.
4. Vane

There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five (5) vertical airflow patterns selected by remote control: 100% horizontal flow, 80% horizontal flow (plus 20% downward airflow), 60% horizontal airflow (plus 40% downward airflow), 40% horizontal airflow (plus 60% downward airflow), and swing. The horizontal vane shall significantly decrease downward air resistance for lower noise levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to

provide horizontal swing airflow movement selected by remote control.

5. Filter

Return air shall be filtered by means of an easily removable washable filter.

6. Coil

The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.

7. Electrical

The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. The power to the indoor unit shall have an option of being supplied from the outdoor unit, using Mitsubishi Electric A-Control system or separate power source for indoor and outdoor units.

8. Control

- a. The control system shall consist of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices.
- b. For A-Control, a three (3) conductor 14 ga. AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.
- c. Where separate power is supplied to the indoor and outdoor units, a two (2) 20 ga. AWG wire shall be run between the units to provide bi-directional control communication..
- d. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.
- e. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit.
- f. The indoor unit shall be connected to a wall mounted wired

controller to perform input functions necessary to operate the system. The wired controller shall have a large multi-language DOT liquid crystal display (LCD) presenting contents in eight (8) different languages, including English, French, Chinese, German, Japanese, Spanish, Russian, and Italian.

- g. There shall be a built-in weekly timer with up to eight pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Dry/Fan mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Vane Position selector, a Louver Swing button, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C). Temperature changes shall be by increments of 1°F (1°C) with a range of 67°F to 87°F (19°C to 30°C).
- h. The wired controller shall display operating conditions such as set temperature, room temperature, pipe temperatures (i.e. liquid, discharge, indoor and outdoor), compressor operating conditions (including running current, frequency, input voltage, On/Off status and operating time), LEV opening pulses, sub cooling and discharge super heat.
- i. Normal operation of the wired controller shall provide individual system control in which one wired controller and one indoor unit are installed in the same room. The controller shall have the capability of controlling up to a maximum of sixteen systems at a maximum developed control cable distance of 1,500 feet (500 meters).
- j. The control voltage from the wired controller to the indoor unit shall be 12 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.
- k. Control system shall control the continued operation of the air sweep louvers, as well as provide On/Off and mode switching. The controller shall have the capability to provide sequential starting with up to fifty seconds delay.

G. Outdoor Unit

- 1. The outdoor unit shall be compatible with the three different types of indoor units (PKA - wall mounted, PCA - ceiling suspending, and PLA - four way ceiling cassette). The connected indoor unit must be of the same capacity as the outdoor unit.
- 2. Models PUY-A24NHA and PUY-A36NHA shall have the option to connect to two indoor units, within the same confined space, to improve air distribution (total capacity shall be equivalent to outdoor unit).

3. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.
4. The outdoor unit shall be capable of operating at 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle may be required).
5. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.
6. System shall have a maximum refrigerant tubing length of 165 feet (50 meters) between indoor and outdoor units without the need for line size changes, traps or additional oil.
7. Models PUZ-A24NHA, PUZ-A30NHA and PUZ-A36NHA shall be pre-charged for a maximum of 70 feet (20 meters) of refrigerant tubing. Model PUZ-A42NHA shall be pre-charged for a maximum of 100 feet (30 meters) of refrigerant tubing. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

8. Cabinet

The casing shall be constructed from galvanized steel plate, coated with a finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a munsell 3Y 7.8/1.1 finish. The fan grille shall be of ABS plastic.

9. Fan

Models PUZ-A24NHA, PUZ-A30NHA, and PUZ-A36NHA shall be furnished with an AC fan motor. Model PUZ-A42NHA shall have two (2) DC fan motors. The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.

10. Coil

The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be control by a microprocessor controlled step motor.

11. Compressor

The compressor for models PUY-A24NHA, PUY-A30NHA and PUY-A36NHA shall be a DC rotary compressor with Variable Compressor Speed Inverter Technology. The compressor for model PUY-A42NHA shall be a scroll compressor with variable speed technology. The

compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

12. Electrical

The electrical power of the unit shall be 208volts or 230 volts, 1 phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Heat pumps shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.
- C. Guarantees, Tests and Training:
 - 1. Efficiency Guarantee: The complete unit guaranteed to operate at the scheduled efficiency or greater over the operating range.
 - 2. Field Training for Owner's Technician - Professional training and certification for operation and maintenance of product to insure proper function and extended life.
- D. Starting Service: After installation is completed, provide a field representative for starting the unit(s) and training the operator. This service not to exceed four (4) consecutive days.

END OF SECTION 15760

UNITARY HEATERS - HVAC-SECTION 15772

1.00 GENERAL:

1.01 SCOPE:

- A. Provisions of this Section shall apply to all HVAC work.

2.00 PRODUCTS:

2.01 RADIANT TUBE HEATERS (VENTED & UNVENTED):

- A. Gas fired infra-red space heaters shall be furnished and installed in accordance with National and Local Codes as shown.
- B. Heaters will be equipped with a direct 100% Globar hot surface ignition control system.
- C. Power supply to each heater will be 120 Volts AC 60 Hz. Heater control will include dual vacuum differential switches to provide a complete shut down in event of combustion air and/or flue blockage.
- D. The heater will be of a positive pressure. Heater will be equipped with a prepurge mode. The heater will be equipped with indicator lights to indicate pressure on and gas valve open.
- E. The material used for the combustion chamber and heat exchanger shall be 16 gauge 4" O.D. aluminized steel. The reflector shall be of bright buffered aluminum.
- F. The fan motor shall be protected by a thermal overload switch and shall have ball bearings.
- G. Unit shall be design certified by the American Gas Association (A.G.A.) and (C.G.A.). The supplier shall provide a manufacturer's written warranty covering the heater's radiant tube element assembly for a period of five (5) years and all components utilized in the heater's control assembly for a period of one (1) year.
- H. Heater shall be designed for vented and unvented application. Provide indoor vent cap, Suntech #WV for unvented heaters.
- I. Provide chains, supports and clamps.
- J. Heater shall be Reznor or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Units shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 15775 – ELECTRIC HEATERSPART 1 - GENERAL1.01 SCOPE

- A. Provisions of this section apply to all HVAC work.

PART 2 - PRODUCTS2.01 ELECTRIC WALL HEATERS:

- A. UL listed recessed convection heaters with finned sheathed heating elements, resiliently mounted direct driven propeller fan with motor heat shield, circuit breaker, concealed thermostat, concealed "On-Off" switch, high limit controls, and junction box for connecting power wiring.
- B. Cabinets: 16-gauge steel, with pencil proof welded steel bar grilles (bars 1/16" X 3/8" minimum). Equip cabinet with adjustable recessing frame. Finish: Baked enamel, over bonderizing. Architect will select the color from manufacturer's standard selections.
- C. Electric Wall Heaters: 2 KW and larger, Markel 3400 Series, less than 2 KW, Markel Series 3420, or approved equal.

2.02 ELECTRIC UNIT HEATERS:

- A. UL listed electric heater having capacity shown with resiliently mounted direct driven propeller fan with guard, finned sheathed heating elements, and enameled steel enclosure not lighter than 20 gauge. Heater shall be equipped with automatic reset high limit controls, power contactors and control transformer for (120) (or) (24) volt control, factory wired to terminal strips.
- B. For horizontal heaters provide adjustable horizontal louvers. For vertical heaters provide (radial) (louver) (cone) (diffusers) (3 ring anemostats).
- C. For each unit heater provide room thermostat to cycle contactor and fan.
- D. Electric Unit Heater shall be manufactured by Chromalox, Markel, Berko, or approved equal.

PART 3 - EXECUTION3.01 INSTALLATION

- A. Unit shall be installed in accordance with manufacturer's recommendations.
- B. See Details for mounting instructions and accessories.

END OF SECTION 15775

SECTION 15810 – FURNACES-HVAC

PART 1 – GENERAL

1.01 SCOPE:

- A. Provisions of this Section shall apply to all HVAC work.

2.00 PRODUCTS:

2.01 DIRECT VENT CONDENSING FURNACE & DX COIL:

- A. Provide external 2" filter rack with hinges and thumb latches.
- B. Each unit shall be a heating and cooling unit bearing AGA approval for natural gas. All operating components shall be assembled together in a single casing.
- C. Casing shall be constructed of galvanized steel not lighter than 18 gauge with epoxy primer and baked enamel finish. Portion of casing in contact with return or supply air shall have 1" thick fiberglass insulation. Casing shall be mounted as shown on drawings.
- D. Cooling cycle components shall include direct expansion cooling coil with aluminum fins and seamless copper tubes and condensate drain pan with corrosion resistant coating.
- E. Motor shall be high efficiency, direct drive 4-speed. Provide slide out blower assembly, blower door safety switch and adjustable fan and limit control.
- F. Provide aluminized steel heat exchanger with 10 year prorated parts warranty. Provide multi-port in hot burners, shot surface ignitor and noncorrosive vent components. Provide power vent blower for discharge of gas fumes with differential proving switch.
- G. Provide alternate bottom/left/right return air connections.
- H. Filter section with 1" thick throwaway filters and latched access doors shall be provided.
- I. Provide left/right gas connection with gas cook, gas pressure regulator and solenoid.
- J. Furnaces shall be manufactured by Trane, Carrier, or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Fans shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION 15810

SECTION 15820 – FANSPART 1 - GENERAL1.01 SCOPE

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS2.01 FANS, CENTRIFUGAL ROOF / WALL EXHAUST:

- A. Centrifugal power roof ventilators with AMCA certified air and sound ratings, belt or direct driven as shown. Provide permanently oiled bearings, statically and dynamically balanced backward curved blade wheels and spun aluminum housing with curb cap, disconnect switches, back draft damper and outlet birdscreen. For belt driven fans provide V belt drive sized for 50% overload, adjustable pitch motor pulley and adjustable motor base. For each fan furnish an 18 gauge galvanized steel insulated prefabricated curb with integral cant. Furnish baffled sound absorbing curbs where required to obtain noise level specified. Static pressure scheduled are external to sound curbs.
- B. For kitchen range hood furnish up blast discharge fan without sound curb, UL-762 labeled for grease laden air and fan wheels are to be Teflon coated. Fan shall be hinged onto curb for access to cleaning the fan.
- C. All roof / wall mounted fans to be factory painted to match louvers, color by Architect
- D. Fans shall be manufactured by Larkin or approved equal.

2.02 FANS, CENTRIFUGAL CEILING EXHAUST

- A. AMCA rated direct drive centrifugal fans for ceiling mounting, complete with removable ceiling grille, disconnect, fan mounted solid state speed control, flexible duct connection, integral backdraft damper and discharge outlet.
- B. Fans shall be manufactured by Greenheck, Cook, Acme, Penn, Twin City, or approved equal.

2.03 FANS, PROPELLER:

- A. AMCA rated fans, belt or direct driven as scheduled. Equip belt driven fans with V belt drives sized for 50% overload, adjustable pitch motor pulleys and adjustable motor bases.
- B. Equip each fan with belt and wheel guards and a mounting panel not lighter than 16 gauge.
- C. Provide gravity or motor operated shutters where indicated in equipment schedule. Equip motor operated shutters with spring return motors with oil immersed gear trains.
- D. Where indicated on plans provide fans equipped with panels reversed for supply

operation.

- E. Where shown provide penthouses constructed of not lighter than 18 gauge galvanized steel and 18 gauge galvanized steel prefabricated curbs. Equip penthouses with access doors and internal insulation not lighter than 1" X 3 lb/cu. ft.
- F. Fans shall be manufactured by Cook, Coolair, Greenheck, Acme, Powerline or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Fans shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION 15820

SECTION 15840 - DUCTWORKPART 1 - GENERAL1.01 SCOPE

- A. Include Section 15010, "GENERAL PROVISIONS - HVAC", with this section.
- B. Provisions of this Section shall apply to all HVAC work.

1.02 SHOP DRAWINGS:

- A. Ductwork shop drawings shall include details of duct constructions: seams, joints, gauges, reinforcing and hanger details for each pressure class and size range together with details of turning vanes, branch connections, dampers and access doors and elevations of all ductwork.

PART 2 - PRODUCTS2.01 DUCTWORK - GENERAL:

- A. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanlike manner from structural members (not roof deck) with adequate bracing and cross bracing to prevent breathing, rattling, and vibration.
- B. No flexible ductwork on return, exhaust or outside air.
- C. Install Duro-Dyne locking quadrants and Duro-Dyne end bearings on all splitters and manual volume dampers located above accessible ceiling and Young #1 regulator, C.P., and Duro-Dyne end bearings elsewhere.
- D. Duct dimensions shown do not include allowance for internal insulation.
- E. Duct Turns: Wherever possible, duct turns shall have a centerline radius equal to 1.5 times the duct width in the plane of the turn. Vane other duct turns to provide a dynamic loss coefficient ("C") not greater than 0.2. No reducing ells or tees to be used.
- F. Duct Sealing: Seal duct seams and joints as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to United Duct Sealer.
 - 1. Class "A" Seal: Seal all joints and seams and leak test as specified.
 - 2. Class "B" Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.
 - 3. Class "C" Seal: Seal entire circumference of all transverse joints.
 - 4. Class "D" Seal: Seal corner of transverse joints.

2.02 DUCTWORK - LOW PRESSURE:

- A. Ductwork: Low Pressure, Pressure and Seal Class shall include:
 - 1. All supply air ductwork: 2" pressure, class "B" seal.
 - 2. All return air ductwork: 2" pressure, class "B" seal.
 - 3. All outside air ductwork: 2" pressure, class "B" seal.
 - 4. General exhaust air ductwork: 2" pressure, class "B" seal.
- B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted.

2.03 FLEXIBLE DUCTS:

- A. Flexible duct connectors: A two (2) element spiral construction composed of galvanized steel supporting spiral and coated woven textile fabric with metal or mineral base, UL listed as Class I Air Duct and Connector (UL 181) minimum R=6.0.
- B. Flexible connectors shall not exceed 5 feet in length.
- C. Make connections between flexible ducts and other equipment using galvanized steel draw bands with plated screws and buckles and United Duct seal for high and medium pressure ducts and nylon draw bands for low pressure ducts.
- D. Factory insulate cold flexible ducts using insulation equivalent to that specified for cold ducts.
- E. Flexible ducts: Thermoflex M-KC, Wiremold 57K, Technaflex 57K, or Flexmaster Type 4M. Submit sample for approval of any other manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Ductwork shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION 15840

SECTION 15850 – SPECIAL DUCTWORK SYSTEM

PART 1 – GENERAL

- A. Include Section 15010, "GENERAL PROVISIONS" with this section.
- B. Provisions of this Section shall apply to all HVAC work.

2.00 PRODUCTS:

2.01 DUCTWORK - KITCHEN EXHAUST:

- A. Make final duct connections to kitchen hoods and dishwashers under this Section.
- B. Kitchen exhaust ducts located above and below kitchen ceiling shall be 18 gauge type 316 stainless steel with all seams and joints welded.
- C. Reinforce ducts as specified for low pressure ducts, above.
- D. Install access doors 20 feet on centers in sides of kitchen exhaust ducts.
- E. Install trapped drain at foot of exhaust riser and extend 1" copper drain line to nearest floor drain or outdoors.
- F. Slope kitchen exhaust duct not less than 2% toward the hood.

3.00 EXECUTION:

INSTALLATION:

- A. Ductwork shall be installed in accordance with SMACNA Standards.
- B. Ductwork shall be installed in accordance with manufacturer's recommendations.
- C. See details for mounting instructions and accessories.

END OF SECTION 15850

SECTION 15860 - DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 SHEET METAL SPECIALTIES:

- A. Make rectangular take-offs in low pressure supply, return and exhaust ducts using 45 degrees entry tap (SMACNA Duct Construction Standards Figure #2-8) with manual damper with end bearings and locking quadrant in branch. End bearings and quadrants shall have air tight duct connections and shaft seals: Ruskin, Duro-Dyne, or approved equal.
- B. Manual balancing dampers: Comply with SMACNA Duct Construction Standards, Figure 2-14 and 2-15. Equip all dampers with locking quadrants and end bearings. End bearings and quadrants shall have air tight duct connections and shaft seal, Ruskin, Duro-Dyne, or approved equal.
- C. When damper quadrants are located other than above lay-in ceilings.
 - 1. Provide all necessary accessories for remote control of balancing dampers without requiring access doors. Substitute Young #1 regulators and an additional end bearing or Ventlock #688 regulators and an additional end bearing for the quadrant (regulators shall be chrome plated), or, Architect/Engineer option.
 - 2. Provide access door for access to the quadrant (See sub-section 2.05 "ACCESS DOORS", hereinafter).
- D. Provide "Stand-Offs" (hat sections) for damper quadrants, controls, etc., on externally insulated ducts.
- E. Branch duct connections for connecting round low pressure branches to rectangular low pressure trunks: spin-in fittings with integral dampers with end bearings, stand-off and beaded collars. Seal Class of components penetrating duct shall be consistent with duct pressure class. Spin-in shall be Flexmaster - FLD. Submit sample for approval of other manufacturers for prior approval.

2.02 FIRE DAMPERS:

- A. Install UL labeled 1-1/2 hour fire dampers wherever sheet metal ducts pass through chase walls, floors, outside fire chases, and elsewhere as shown or required by local Code. Install dampers per SMACNA "Fire Damper Guide" and UL 555.
 - 1. Fire dampers shall be Type "B" "Venation Blind" dampers. Unless otherwise shown folded blades shall not obstruct duct. Dampers in floors shall be spring loaded.
 - 2. Provide factory fabricated steel integral wall sleeve 3" longer than wall

thickness for each fire damper and install sleeve using bolts and angles as detailed in Figure #1 of SMACNA "Fire Damper Guide".

3. Provide rectangular, round and/or flat-oval collars. See Drawings for sizes and locations.
 4. For aluminum ductwork provide stainless steel fire dampers.
- B. Install ceiling fire dampers in all fire rated ceiling as shown in Figure #11 of SMACNA "Fire Damper Guide" at ceiling penetrations as noted. Fire rated diffuser assembly to be approved for the specific UL Classification of the ceiling assembly used.
- C. Install access door in low pressure ducts at each fire damper. Install wall or ceiling access door for access to fire dampers not accessible through lift-out ceilings. See sub-section 2.05 "ACCESS DOORS", below.
- D. Install three (3) hour fire dampers where sheet metal ducts pierce 4 hour fire walls. Three (3) hour fire damper shall consist of a three (3) hour UL labeled fire door pivoted in a 3" X 3" X 1/4" angle frame bolted through wall. Equip door frame with angle flange and latch. Install Fire Door as shown in Figure 25 and 26 of SMACNA "Fire Damper Guide".

2.03 AUTOMATIC DAMPERS:

- A. Factory fabricated dampers with extruded aluminum airfoil blades and frame with full gasket stops for blades ends. Equip blades with air tight plastic or butyl rubber seals and bronze or nylon bearings. Provide jamb seals. Damper widths from 12" to 60" wide shall not leak any greater than 8 cfm sq. ft. at 4" w.g. and a maximum of 3 CFM sq. ft. at 1" w.g. Ruskin CD50 or approved equal.
- B. Automatic dampers located near fan outlets or in ducts having maximum velocities exceeding 1500 FPM shall have extruded aluminum air-foil blades and all linkages shall be located outside of airstream. Such dampers shall have leakage rates not exceeding 1% maximum design flow at 4" WG pressure differential.

2.04 SMOKE DETECTORS:

- A. Smoke detectors shall be ionization detectors which detect product of combustion. Furnish, wire, and install smoke detectors under this Section. Provide remote visual/audio indicator mounted on the ceiling near the detector.
- B. Locate smoke detectors so that indicating lights are visible and so that they will not be affected by moisture from coils or humidifiers.

2.05 ACCESS DOORS:

- B. Access doors in low pressure ducts: Galvanized steel frame with gasket permanently secured to duct with a removable gasket access port held in place with screw driver or thumb operated latches. Door in insulated ducts: Double thickness with insulation. Doors in non-insulated ducts: A single thickness. Weld door frames to kitchen exhaust ducts. Size doors to permit removal of equipment or maintenance. Minimum size 12" X 12".
- E. Mark access points in lift-out ceilings with brass paper brads. Bend points of brads over top of ceiling.

2.06 FLEXIBLE DUCT CONNECTIONS:

- A. Install Neoprene coated glass cloth flexible connections at all duct connections to all fans and AC Units.
- B. Install flexible connections in all ducts at building expansion joints.

2.07 ELECTRICAL GROUNDING:

- A. Ground all fans.
- B. Install braided copper jumpers around all flexible connections, taking care that jumpers do not bind flexes.

2.08 INTAKE AND RELIEF ROOF HOOD:

- A. Factory fabricated spun aluminum ventilator with integral curb cap and birdscreen. Equip hood with galvanized steel curb with wood nailer. Minimum material gauges, hood 20 gauge, base 18 gauge, curb 18 gauge.
- B. Gravity Roof Ventilators shall be manufactured by Greenheck, Cook or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Duct shall be installed in accordance with SMACNA Standards.
- B. Equipment shall be installed in accordance with manufacturer's recommendations.
- C. See details for mounting instructions and accessories.

END OF SECTION 15860

SECTION 15870 - OUTLETSPART 1 - GENERAL1.01 SCOPE

- A. Include section 15010 "GENERAL PROVISIONS" with this section.
- B. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS2.01 GRILLES, REGISTERS AND DIFFUSERS:

- A. General: Air devices may be Titus, Price, Nailor, Krueger, or approved equal. Where fire dampers are required at grilles, provide steel grilles, not aluminum.
- B. Architectural Supply Diffuser (S): The diffuser shall have an 18 gauge steel face panel, which shall be a one piece assembly, removable by means of four positive locking posts. The exposed surface of the face panel shall be smooth, flat, and free of visible fasteners. The face panel shall project 1/4" below the outside border of the diffuser back pan. The back of the face panel shall have an aerodynamically shaped, rolled edge to ensure a tight horizontal discharge pattern. The back pan shall be one piece precision die-stamped and shall include an integrally drawn inlet. The diffuser back pan shall be constructed of 22 gauge steel. The finish shall be #26 white. The pencil hardness must be HB to H. Provide round damper constructed of heavy gauge steel. Damper must be operable from the face of the diffuser. Option AL downblow clips shall be provided to restrict the discharge air in certain directions. The manufacturer shall provide published performance data for the square panel diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991. Diffuser shall be Titus "OMNI".
- C. Supply Registers (SR): Adjustable vertical deflection, adjustable horizontal deflection, removable core, opposed blade damper and multi-blade scoop and off white baked enamel finish. Titus "272FS".
- D. Bar Return Grille (BRG): All steel, heavy duty, 16 gauge border, 14 gauge blades, 1/2" spacing, 38° deflection. Provide all frames. Titus "33R".
- E. Wall Return Grilles (WRG): Horizontal bars fixed at about 15° angle, close spacing and plaster frames. Off white baked enamel finish. Titus "350FL".
- F. Wall Return Register (WRR): Horizontal bars fixed at about 15° angle, plaster frames and opposed blade damper. Off white baked enamel finish. Titus "350FL".
- G. Ceiling Return Grilles (R), Ceiling Exhaust Grilles (E) and Transfer Air Grilles (T): All aluminum, 1/2" X 1/2" X 1/2" cube core and plaster frames as needed. Off-white baked enamel finish. Provide 24 x 24 panel so grille will fit in 24 x 24 ceiling grid. Titus "50F".

2.02 WEATHER LOUVERS:

- A. Louvers shall be 6" thick extruded aluminum louvers with 12 gauge blades with drainable head frame, drainable blades, water stop, and with angled sill. 57% F.A. minimum. Equip with 1/2" mesh aluminum birdscreen on inside of louver. Finishes: Kynar. Submit color sample to Architect (20 year warranty on finish). Ruskin ELF6375DX, Louvers &

Dampers, Greenheck, Airolite, or approved equal.

B. Storm Shelter Louvers:

1. The grilles must be furnished and include the following:
 - a. FEMA 361 Standards for 200 + mph wind speed and large missile impact resistance.
2. Performance Requirements: Missile impact protective grille with a nominal 2 x 4 of not less than 15 lbs. in weight at a velocity of not less than 155 ft./sec. Grille must withstand impacts without visible damage and must prevent missiles from penetrating through.
3. Design Wind Load: Incorporate structural supports and mullions required to withstand design wind load of ± 150 PSF.
4. Warranty: Provide written warranty to the owner that all products will be free of defective materials or workmanship for a period of one year from date of installation.
5. The grilles and related materials herein specified and indicated on the drawings shall be as manufactured by: Ruskin, HPG3848 Protective Impact Grille, or approved equal.
6. Grille Fabrication:
 - a. Frame:
 1. Material: Hot rolled steel.
 2. Wall Thickness: .25 inch, nominal.
 3. Depth: 8 inches.
 - b. Blades:
 1. Style: Sightproof, horizontally mounted.
 2. Material: Hot rolled steel.
 3. Wall Thickness: .25 inch, nominal.
 4. Centers: 2.125 inches, nominal.
7. Assembly: Factory assemble grille components.
8. Maximum assembly size: 80" wide x 60" tall or 60" wide x 80" tall.
9. Finishes:
 - a. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces that will be visible after completing finishing process. Provide color as indicated or, if not otherwise indicated, as selected by architect.
 - b. Fluorocarbon Coating:

1. Grilles to be finished with an inhibitive thermo-cured primer, 0.2 mil minimum dry film thickness, and a thermo cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil minimum dry film thickness.
 2. All material shall be thoroughly cleaned and given a pre treatment before application of the Kynar/Hylar coating. The coating shall receive a bake cycle of 17 minutes at 450°F. All finishing procedures shall be one continuous operation in the plant of the manufacturer.
- c. Wind Drive Rain Resistant Louvers: Extruded aluminum, wind driven rain resistant, stationary louvers with horizontally mounted sight proof blades.
1. References:
 - A. AAMA 605.2 - High Performance Organic Coatings on architectural Extrusions and Panels.
 - B. AMCA 500-L - Test Methods for Louvers.
 - C. AMCA 511 - Certified Ratings Program for Air Control Devices.
 2. Submittals:
 - A. Product Data: Submit manufacturer's product data including performance data.
 3. Shop Drawings: Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.
 4. Delivery, Storage and Handling:
 - A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
 - B. Storage: Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.
 - C. Handling: Protect materials and finishes during handling and installation to prevent damage.
 5. Manufacturer:
 - A. Ruskin. Louvers & Dampers, Greenheck, Airolite, or approved equal.
 6. Extruded Aluminum Stationary Louvers:
 - A. Fabrication: Ruskin Model #EME520DD.

B. Frame:

1. Material: Extruded aluminum, Alloy 6063-T5.
2. Wall Thickness: 0.081 inch, nominal.
3. Depth: 5 inches.

C. Blades:

1. Style: Sightproof, double drainable, horizontally mounted.
2. Material: Extruded aluminum, Alloy 6063-T5.
3. Wall Thickness: 0.081 inch, nominal.
4. Centers: 2 inches, nominal.

D. Bird Screen:

1. Material: Aluminum, 3/4 inch x 0.051 inch, expanded, flattened.
2. Frame: Removable, rewireable.
3. Assembly: Factory assembled louver components.

E. Performance Data:

1. Based on testing 48 inch x 48 inch size unit in accordance with AMCA 500-L.
2. Free Area: 44 percent, nominal.
3. Free Area Size: 6.99 square feet.
4. Maximum Recommended Air Flow Thru Free Area: 1,139 fpm.
5. Maximum Pressure Drop (at 1,139 feet per minute): 0.21 inches w.g.

F. Wind Driven Water Penetration Performance:

1. Based on testing 39 inch x 39 inch core area, 41 inch x 44 inch nominal size unit in accordance with AMCA 500-L.
2. Wind Velocity: 29 mph.
3. Rainfall Rate: 3 inches/hour.

4. Air Volume: 6,207 cfm.
 5. Core Velocity: 588 fpm.
 6. Free Area Velocity: 1,139 feet per minute.
 7. Water Resistance Effectiveness: 99.3% (AMCA Class A).
 8. Discharge Loss Classification (Intake Test): Class 2 (.3 to .399).
7. Factory Finish:
- A. Kynar 500 Fluoropolymer Coating:
 1. Conform to AAMA 605.2.
 2. Apply coating following cleaning and pretreatment.
 3. Cleaning: AA-C12C42R1X.
 4. Dry louvers before final finish application.
 5. Total Dry Film Thickness: Approximately 1.2 mils, when baked at 450° F for 10 minutes.
 8. Color: Color as selected by Architect from manufacturer's standard colors.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Equipment shall be installed in accordance with SMACNA Standards and manufacturer's recommendations.
- B. See details for mounting instructions and accessories.
- C. Secure louver to structure to comply with FEMA 361 and the following:
 1. Substrate: CMU, Grout filled. 1500 Min. PSI
 - a. Anchor Type: 3/4 inch (19 mm) diameter Hilti HIT HY 150 x 8 in (203) long threaded adhesive anchor.
 - b. Embedment: 6-3/4 inches (172 mm) minimum.
 - c. Factory Attachment Angle secured at factory.
 - d. Shipped Loose Attachment Angle: 4 in x 6 in x 20 in long (102 x 152 x 508) A36 HDG angle. 1/2 in (13) thick.
 2. Substrate: Concrete 2500 PSI Minimum Compression Strength.
 - a. Anchor Type: Hilti Kwik Bolt TZ CS III 1/2 (6) diameter x 3-3/4 in (95) long
 - b. Embedment: 3-1/2 inches (89 mm) minimum.
 - c. Factory Attachment Angle secured at factory.

3. Substrate: Steel Framing.
 - a. Factory Attachment Angle secured at factory.

END OF SECTION

FILTERS – HVAC - SECTION 15880

1.00 GENERAL:

1.01 SCOPE:

- A. Provisions of this section apply to all HVAC work.

2.00 PRODUCTS:

2.01 FILTERS - AIR:

- A. 30% Filters, 1" or 2" Thick (Maximum allowed by MFR): Throwaway deep pleated filters, maximum face velocity 350 fpm. Maximum initial pressure drop 0.1" WG, UL Class 1, 30% efficiency per ASHRAE Test Standard 52-76, minimum ratio of media area to face area 4.4:1. Turn system over to Owner with clean filters and provide one (1) set of spare filters. Farr 30/30 or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

- A. Filters shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 15900 - CONTROLS

PART 1 - GENERAL

1.01 SCOPE

- A. Include Section 15010 "GENERAL PROVISIONS", with this Section.
- B. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 CONTROL SYSTEMS

- A. Furnish and install complete and ready for operation with control sequences specified below.
- B. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three (3) years: Trane, Carrier, Johnson Controls, or approved equal.
- C. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the Control Manufacturer.
- D. Include the services of a full time control technician for calibrating and adjusting controls for the first 5 working days after Owner has occupied building.
- E. Before installation, submit for approval five (5) copies of complete power and control wiring and piping diagrams.
- F. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (White on black).
- G. Permanently identify control devices other than room thermostats, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink.
- H. At controls contractor option, system may be wireless communication.

2.02 CONTROL WIRING:

- A. Include control and interlock wiring and power wiring for control panel in this Section. Install in conduit in accordance with provisions of Electrical Work where exposed, concealed in walls or above ceilings other than lay-in type. Provide plenum rated cable above lay-in ceilings (for plenum or non-plenum).
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls partitions.
- C. Wire all devices individually to terminal strips in control panels.
- D. Furnish necessary relays and auxiliary contactors and other accessories required.

Provide interlock relays per NEC. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters, Variable Frequency Drive (VFD) and Motors Control Centers specified in Electrical Work.

2.03 CONTROL DEVICES:

- A. Room Thermostats: (Provide seven (7) day occupied/unoccupied, 24 hour, multi-stage programmable thermostats, with 3-hour override, and battery back-up. Thermostats to be provided with local control. Thermostat covers: lockable high impact plastic. Mount room thermostats with tops 4 feet above floors.
- B. Remote Bulb Thermostats (DDC) and Temperature Transmitters (DDC): Unless otherwise shown use averaging elements not less than 12 feet long for duct or casing cross sections for each 24 square feet of face area.
- C. Thermometers: Pipe line thermometers are specified in another Section. Install digital readout thermometers in ducts where shown on control diagrams, providing averaging bulbs where shown and/or required.
- D. Freezestats: Manual reset, pneumatic not permitted. Locate freezestat bulbs between preheat and chilled water coils in units with chilled water coils and downstream from DX coils in units with DX coils. Provide coverage for each 3' X 3' coil face area section.
- E. Firestats: Single pole double throw, electric, manual reset, pneumatic not permitted. Firestats shown to be connected to the fire alarm system: compatible with fire alarm system, furnished and installed under Controls, wired under Electrical Work. Firestats to be installed in all fans where smoke detectors are not furnished.
- F. Program Clocks / Timers:
Provide digital time clock with 365 day holiday capabilities with 24 single dates, 99 setpoints, separate scheduling for each day of the week, AM/PM format, one minute programming resolution, portable memory module, optional programmer for integration into a Windows based PC for program duplication and modifications, LCD display, daylight savings or standard time, automatic leap year correction, permanent schedule retention, 100 hours of backup, manual override, Nema 3 indoor/outdoor enclosure. Clock/Timer to be Tork or approved equal.
- G. Valve and Damper Operators: Of sufficient power to close/open valves and dampers under operating conditions. Electric valve and damper motors shall have oil immersed gear trains and spring return to normal position.
- H. Wells: Install pipe line mounted control and indicating devices in stainless steel or brass thermometer wells.
- I. Capillary Supports: Securely support all duct-mounted and casing- mounting thermostat capillaries using factory fabricated copper bulb supports.
- J. Provide stand-offs for control devices mounted on externally insulated ducts and equipment.
- K. Anchor all items mounted on gypsum board (dry-wall) using toggle bolts or moly bolts, not expansion shields.

2.04 CONTROL POWER:

- A. All 120 Volt wiring shall be the responsibility of the Control Sub-Contractor from circuit furnished under Electrical Section. Coordinate circuit locations with General and Electrical Contractors.
- B. Power wiring to all automatic dampers shall be included under this section.
- C. Wiring and relays between light and fans for interlock shall be included under this section.

2.05 CONTROL SEQUENCES:

- A. As shown on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Control diagrams on drawings and/or Control Sequences are intended to indicate, in general, control arrangements. Provide all instruments, relays, operators, switches, etc. required to accomplish control sequences whether or not such devices are actually shown.

END OF SECTION 15900

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Project: SOUTHSIDE FIRE STATION
Architect: Thomas M. McElrath, Architect
EE Group. Project Number: 4712-21

DIVISION	SECTION TITLE
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26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
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26 05 33	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
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26 51 00	INTERIOR LIGHTING
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26 80 00	ACCESS CONTROL SYSTEM
26 90 00	STRUCTURED CABLING SYSTEM

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PART 1 - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

- A. The following codes and standards are referenced in this document.
 - 1. NFPA 70, National Electrical Code, 2017
 - 2. ASHRAE 90.1, Energy Standard for Buildings, 2013
 - 3. International Fire Code (IFC) 2015
 - 4. International Building Code (IBC) 2015
 - 5. Americans with Disabilities Act Accessibility Guidelines (ADAAG) 2010
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

- A. Arrange with the local utility companies for providing such electrical services as shown on drawings or herein specified. Coordinate all requirements for the electrical services shown on the plans with the utility engineering and construction supervisors prior to bidding and/or roughing. NOTIFY ENGINEER IN WRITING OF DISCREPANCIES BETWEEN PLANS AND UTILITY REQUIREMENTS FOR RESOLUTION PRIOR TO BIDDING.
- B. All aid to construction charges for permanent power to be paid direct by owner. All aid to construction charges for temporary power to be included in bid price and to be paid by contractor.
- C. Remove or relocate all electrical services located on or crossing through the Project property, either above or below grade, which would obstruct the construction of the Project or conflict in any manner with the completed Project or any Code pertaining thereto. See Civil Engineering Plans in addition to electrical site plan for work required. Although the design team has made every effort to correctly represent existing conditions on site, it is the contractor's responsibility to visit the site and determine the extent of the required demolition and new electrical work.
- D. Furnish and install complete temporary electrical light and power system during construction period. The required temporary lighting required during finish work shall be sufficient so as to facilitate other trades (finishes). Coordinate lighting requirements where interior finishes are being applied with the general contractor and/or painting subcontractor.
- E. Furnish and install complete electrical light and power systems.
- F. Connect all meters, panelboards, circuit breakers, power outlets, convenience outlets, switches and/or other equipment forming part of the system.
- G. Furnish and install complete system of outlet boxes, faceplates, conduit raceways, cables and terminal cabinets for IT and security systems system.
- H. Connect all electrical equipment noted in this Section or noted on Drawings, whether furnished by Electrical Contractor or by others.
- I. The electrical contractor shall review all sections of the contract documents (Plans and Specifications) and shall endeavor to determine all equipment requiring electrical power whether shown on the electrical plans or not. Notify the Electrical Engineer in

writing prior to the bid with any discrepancies with mechanical and/or plumbing plans. Include in bid price all required materials and labor required for a full functioning system/building.

- J. Connect all mechanical and plumbing equipment as required to provide a full functioning system as specified by the Mechanical Engineer. Verify locations for all dampers (control dampers and fire/smoke dampers), circulating pumps, fans, boilers, water heaters and other loads with the mechanical and plumbing plans prior to bidding.
- K. Install all starters as shown on plans or as called for in these Specifications. All starters shall be NEMA rated. All VF drives for mechanical equipment shall be furnished and installed by mechanical contractor with power feeder and final connections to the VF drive by the electrical contractor.
- L. Furnish and install all disconnect switches.
- M. Furnish and install power wiring and connection for starters and motors. Furnish and install all control wiring specifically shown on drawings or as required to make the system operational as designed.
- N. Furnish and install generator set and transfer switch as shown on the plans. Provide and install control wiring, annunciators, connections, testing and startup for complete system.
- O. Provide and install lighting control system for Bunk, Apparatus Room, Day room, entryway and secure corridor lighting as shown on the plans. Provide and install interface with alarm system to automatically turn lights ON to full bright in Bunks, Secure Corridor and Apparatus Room Lights. Provide and install dimming controls in bunk rooms as shown. Provide astronomic timeclock control for entryway lighting. Provide and install occupancy sensing with manual overrides for Secure Corridor. Provide manual, non-dimmed control of apparatus room lights.
- P. Furnish and install Auxiliary Systems as shown on the Drawings and as required.
- Q. Procure and pay for permits and certificates as required by local and state ordinances and Fire Underwriters Certificate of Inspection.
- R. Submit to Architect, a certificate of Final Inspection from local inspection department.
- S. Work noted "NIC" (Not in Contract) shall be excluded from the work to be done by this trade, as follows:
 - 1. A complete System of Control Wiring for the Mechanical System (unless specifically shown on Drawings).
 - 2. Motors in place by others, connection for correct rotation by this trade.
- T. Division 26 will be responsible to support the commissioning requirements specified in section 01 91 13 and other sections referenced in 01 91 13.

1.3 DRAWINGS AND SPECIFICATIONS

- A. Electrical work shown on drawings inclusive. Follow any supplementary drawings as though listed above.
- B. Drawings and Specifications are complementary. Work called for by one is binding as if called for by both.

- C. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices and routing of conduits to a reasonable extent, without extra cost to Owner.
- D. Refer conflicts between drawings and specifications describing electrical work and work under other Sections to Architect for remedial action.
- E. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
- F. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which should have been foreseen had examination been made, will not be recognized.

1.4 PROJECT COORDINATION MEETINGS

- A. Promptly after award of the Contract, and prior to commencing any project related activities. The Successful Electrical Contractor shall contact the Electrical Engineer to schedule an acceptable date and time for the initial project coordination meeting. This meeting will be held at the Electrical Engineer's office at the scheduled time to discuss any/all issues related to the electrical aspects of the Project. The Contractor, as well as the contractor's job foreman/superintendent for the project is required to attend this meeting. The contractor shall furnish a complete set of Plans and Specifications at this meeting.

1.5 EXISTING CONDITIONS

- A. The Contractor shall visit the site and determine all conditions that affect this Contract. Contractor shall include in bid price cost of relocating any electrical or auxiliary lines and/or equipment as required whether shown or not. Failure to do so will not relieve Contractor of his/her responsibility under this contract.

1.6 TEMPORARY SYSTEMS

- A. The Contractor shall be responsible for the furnishing and installation of all equipment and materials necessary for providing electrical power and lighting to the new building during construction. All temporary wiring shall be made in a safe and approved manner.
- B. It shall be the responsibility of the electrical contractor to visit the site prior to submitting bid and thoroughly review all existing conditions affecting the temporary systems requirements.
- C. The contractor shall provide temporary lighting levels as necessary where interior finishes are being applied. Coordinate with general contractor for required lighting.

1.7 CONTRACTOR QUALIFICATIONS

- A. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.
- B. All electrical contractors whose submitting bids for this project shall be licensed as an electrical sub-contractor in accordance with the State of Alabama Licensing Board for General Contractors.

- C. The Electrical Contractor shall be properly licensed (before the bid date) to bid and perform the project. This includes being a properly licensed general Contractor in the State of Alabama, such as having a State of Alabama General contractors License with the Major Classifications "Building Construction" (BC) and "Municipal & Utility" (MU), or a General Contractors License in "Specialty Construction" – Electrical (E), as applicable
- D. The Electrical Contractor shall use properly licensed journeymen, and apprentices that are professional craftsmen in the applicable field and provide documentation.
- E. The Electrical Contractor shall possess and provide proof of insurance with coverage and limits meeting or exceeding those prescribed under the laws of the State of Alabama for Liability and Workers' Compensation.
- F. The Electrical Contractor and his/her sub-contractors shall have been in business (under the same name and principal control) for five (5) years prior to date of opening bids and shall have past experience in the types of work involved in this project, and be regularly engaged in all the applicable types of work. Documentation shall be provided on past projects with references for at least five projects or similar type, size and scope.
- G. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory-authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.
- H. The Electrical Contractor shall use State of Alabama licensed masters and journeymen electricians as job superintendents. The Electrical Contractors superintendent (Journeyman or Master Electrician) shall be on site when electrical work is being performed. The Electrical Contractor shall have on Journeyman or Master Electrical on site for every eight (8) apprentices.

1.8 QUALITY ASSURANCE

- A. All work shall be in accordance with the NFPA 70 National Electrical Code NEC 2017 and the rules and regulations of the local bodies having jurisdiction.
- B. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.
- C. Work under this Section shall be first class with emphasis on neatness and workmanship.
- D. Install work using competent mechanics under supervision of foreman, all duly certified by local authorities. Installation subject to Architect's constant observation, final approval, and acceptance. Architect may reject unsuitable work.
- E. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Section is proven to be defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.
- F. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.9 ON-SITE OBSERVATIONS AND DEMONSTRATION OF FUNCTIONALITY

- A. Contractor shall notify Engineer at least three (3) days prior to covering any underground feeders, pouring slab, installing ceiling systems in order to allow time for on-site observations.
- B. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.
- C. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner or as called for in other sections of this specification. Contractor shall notify Engineer and Architect two (2) weeks prior to demonstration of systems where manufacturer assistance is required.
- D. Perform test required by Architect to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.

1.10 PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION

- A. Take all precautions to provide safety and protection to persons and protection of materials and property as necessary, including protection from injury from rotating or moving equipment, tools, hot surfaces, holes, shafts, falling objects, electrical energy and all other potential hazards. Erect sign, barricades, warning lights, instruct workmen and others who may be subject to construction hazards.
- B. Protect items of equipment from stain, corrosion, scratches and any other damage or dirt, whether in storage at job site or installed. No damaged or dirty equipment, lenses or reflectors will be accepted.

1.11 CLEARANCE WITH UTILITIES

- A. Before submitting a proposal, check with all authorities or utilities concerned as to points of connection with power and telephone lines, installation of transformers, location of service cut-in and metering, requirements as to any additional service equipment, and other details of the installation. If their requirements are at variance with these specifications or drawings and involve extra expense, these requirements shall be included in bid and the contract price shall include all costs necessary to meet those requirements without extra cost to the Owner after a contract is entered into.

1.12 CHANGES ORDERS AND ADDITIONAL WORK

- A. No change shall be made from the work as called for by these specifications and drawings except on written order of the Architect. Deviations from drawings and specifications shall be made in submittal form and shall include all information for approval including drawings where required. No change for extra work will be allowed unless such extra work has been duly authorized by a written order of the Architect stating the change to be made.

1.13 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

- C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- E. Coordinate connecting electrical service to components furnished under other Sections.
- F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.
- H. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

1.14 AS-BUILT DRAWINGS

- A. Contractor to provide to owner at project completion the following:
 - 1. Two (2) compact disc/DVD volumes with color pdf files showing any/all deviations to the contract documents.
 - 2. One each set of electrical plans on reproducible media indicating any/all deviations to contract documents.

1.15 COORDINATION WITH OTHER TRADES

- A. Review all specification sections and drawings including HVAC, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.
- B. Contractor to coordinate all aspects of mechanical equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved submittals prior to roughing. Coordinate exact connection locations with the mechanical contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.
- C. Contractor to coordinate all aspects of plumbing equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved equipment submittals prior to roughing. Coordinate exact connection locations with plumbing contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.
- D. Coordination Shop Drawings: Electrical contractor shall coordinate with other trades (structural, mechanical, plumbing, and fire protection) to determine the space required, and the routing and locations of their respective trades. Prepare shop drawings at $\frac{1}{4}" = 1'-0"$ scale for all electrical rooms and rooms with electrical panels, main data frame room (MDF), intermediate data frame rooms (IDF), and corridors showing electrical, fire protection, mechanical, and plumbing work with elevations to equipment, conduit

routing, and clearances for equipment noted. Failure to coordinate does not constitute a change order when components will not fit within the allocated space and may result in installed equipment and materials being removed at the contractor's expense.

- E. Electrical requirements, roughing locations, auxiliary conduit requirements, etc. for Door control equipment, SCBA equipment, Laundry equipment, and Kitchen equipment shall be coordinated with approved equipment submittals prior to any roughing. Notify engineer in writing of discrepancies between plans and submittals/requirements. Contractor shall provide any/all conduits and wiring required for a complete system as specified.
- F. shall coordinate with other trades (structural, mechanical, plumbing, and fire protection) to determine the space required, and the routing and locations of their respective trades. Prepare shop drawings at $\frac{1}{4}" = 1'-0"$ scale for all electrical rooms and rooms with electrical panels, main data frame room (MDF), intermediate data frame rooms (IDF), and corridors showing electrical, fire protection, mechanical, and plumbing work with elevations to equipment, conduit routing, and clearances for equipment noted. Failure to coordinate does not constitute a change order when components will not fit within the allocated space and may result in installed equipment and materials being removed at the contractor's expense.

PART 2 - ELECTRICAL PRODUCT REQUIREMENTS

2.1 SUBMITTALS AND MATERIALS DATA

- A. For this project - all submittals under this division shall be provided in searchable PDF file format. All warranty materials and O&M manuals shall be provided in searchable PDF file format.
- B. The approval of shop drawing shall not be interpreted as a complete check by the Engineer, but will indicate only that the general specifications for the equipment to be provided is satisfactory. Approval of such drawings does not relieve the contractor of responsibility of coordination of components, auxiliary equipment, accessories or special conditions required for satisfactory operation of the completed system.
- C. All shop drawings for a specific item shall be made in one submittal. No submittals will be checked until all required submittals are received by the Engineer. All submittals must be approved prior to commencing any work on this project.
- D. The electrical contractor shall check all suppliers' submittals regarding measurements, capacity, performance, and details to satisfy him/herself that they conform to the intent of the contract drawings and specifications. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by him. Drawings submitted without this stamp of approval will not be considered and will be returned for contractor approval and stamp. A minimum of ten (10) working days shall be allowed for checking for submittals.
- E. Any materials and equipment listed which are not in accordance with specification requirements may be rejected.
- F. All submittals shall clearly identify the item submitted. Standard catalog sheets shall be marked, in ink to identify which item is to be considered. All drawings submitted must be by factory as field drawings will not be accepted.

2.2 ELECTRICAL PRODUCT SUBSTITUTIONS

- A. Any proposed substitution of equipment or materials from that specified must be submitted in writing to the Engineer within ten (10) days prior to the bid date. The Engineer will respond in writing as to the acceptance/rejection of the proposed product. Faxed transmittals, e-mails and verbal requests will not be considered.
- B. All proposed substitutions shall clearly identify the item submitted as well as the technical information that is called for in other portions of the Electrical Divisions of this Specification. Standard catalog sheets shall be marked, in ink to identify which item is to be considered. All drawings submitted must be by prepared by the factory as field/distributor-prepared drawings will not be accepted.
- C. It is the contractor's sole responsibility to insure that any/ all costs associated with additional materials, labor, setup, programming and coordination required for, or associated with, the inclusion of any products/ systems specified as an equal or pre-approved equal to the product/ system specified in his/ her bid are included in the bid price. No change order will be accepted on the basis of additional work or materials required as a result of a product substitution.

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

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. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Encore Wire Corporation.
 - 3. General Cable Technologies Corporation.
 - 4. Southwire Incorporated.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2, THWN-2, Type XHHW-2, and Type SO.
- D. VFC Cable:
 - 1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.

2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in Classes I and II, Division 2 hazardous location applications as required.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. Ideal Industries, Inc.
 4. O-Z/Gedney; a brand of the EGS Electrical Group.
 5. 3M; Electrical Markets Division.
 6. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 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 NFPA 70.

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. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).

- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- H. Branch Circuits Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.
- I. 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 26 05 33 "Raceways and Boxes" 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 26 05 29 "Hangers and Supports for Electrical Systems."

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 12 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "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 26 05 44 "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 IBC 711 and 712, latest revision."

3.8 FIELD QUALITY CONTROL

- A. Provide third party, NETA certified technician to perform the following tests and inspections:

- 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance conductors, all panelboard feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.

- a. Generator Set.

- 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

- 3. Perform electrical test.

- B. Test and Inspection Reports: Prepare a written report to record the following:

- 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

26 05 19 - 5 LOW VOLTAGE POWER CONDUCTORS AND CABLES

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

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 systems and equipment.
- B. Section includes grounding systems and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Plans showing dimensioned as-built 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.
 - 5. Grounding for sensitive electronic equipment.
 - 6. Grounding equipment enclosures.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.
- C. Comply with NFPA 70, Section 250 (National Electrical Code) for grounding and bonding.

PART 2 - PRODUCTS

2.1 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 12 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. Lexan or PVC, impulse tested at 5000 V.

2.2 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. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, 3/4 inch diameter by 10 feet in length.
- B. Chemical-Enhanced Grounding Electrodes (where required to achieve specified grounding system resistance values): 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.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 1. Bury at least 24 inches below grade.
- C. Grounding Bus: Install in electrical and telephone/IT equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus 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 to specified height above floor; connect to horizontal bus.
- D. 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.
 5. Connection to Ufer electrode – Welded connector
- E. All cable trays to be grounded per NFPA 70, Article 392 as required for conductor enclosure in accordance with NFPA 70 article 250. Provide bonding jumpers (#8 AWG) between each section. Provide bonding jumper (#4 AWG) from tray system to system ground. Bond all conduits terminated at cable tray

3.2 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. 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.
 8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- 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. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 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 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 two-rod lengths from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. 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.
- D. 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 above-ground portion of gas piping system downstream from equipment shutoff valve.

- E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- F. 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.
- G. Ufer Ground (Concrete-Encased Grounding Electrode): 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.

3.4 LABELING

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. 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, at ground test wells, 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.

- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. 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: 5 ohms.
 - 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).
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.
 - 5.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in architectural specifications

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. 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.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements specified elsewhere "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- E. All cable trays to be grounded per NFPA 70, Article 392 as required for conductor enclosure in accordance with NFPA 70 article 250. Provide bonding jumpers (#8 AWG)

between each section. Provide bonding jumper (#4 AWG) from tray system to system ground. Bond all conduits terminated at cable tray.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. 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.
- C. 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. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. 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.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements specified elsewhere "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 unless otherwise shown. Concrete materials, reinforcement, and placement requirements are specified elsewhere.

- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements specified elsewhere in these specifications for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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. Non-metal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Non-metal wireways and auxiliary gutters.
 - 5. Boxes, enclosures, and cabinets.
 - 6. Hand holes and boxes for exterior underground cabling.

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 all products specified in this section.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.
- C. Samples: For wireways and/or 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

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. 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.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

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 886 and NFPA 70.
2. Fittings for EMT:

- a. Material: Steel.
 - b. Type: Setscrew or 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.
- 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 NON-METALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.
 - 3. Arnco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.
 - 6. Condux International, Inc.
 - 7. Electri-Flex Company.
 - 8. Kraloy.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Niedax-Kleinhuis USA, Inc.
 - 11. RACO; a Hubbell company.
 - 12. Thomas & Betts Corporation.
- B. 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.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. RTRC: Comply with UL 1684A and NEMA TC 14.
- F. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: Comply with UL 514B.
- H. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
 2. Hoffman; a Pentair company.
 3. Mono-Systems, Inc.
 4. Square D; a brand of Schneider Electric.
- B. 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.
- C. 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.
- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Adalet.
 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 3. EGS/Appleton Electric.
 4. Erickson Electrical Equipment Company.
 5. FSR Inc.
 6. Hoffman; a Pentair company.
 7. Hubbell Incorporated; Killark Division.
 8. Kraloy.
 9. Milbank Manufacturing Co.
 10. Mono-Systems, Inc.
 11. O-Z/Gedney; a brand of EGS Electrical Group.
 12. RACO; a Hubbell Company.
 13. Robroy Industries.
 14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Metal Floor Boxes:
 - 1. Material: As shown on the plans.
 - 2. Type: As shown on the plans.
 - 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. 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.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- J. Gangable boxes are prohibited.
- K. 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.
- L. 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.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
 - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
 - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Composite Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell - Quazite
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation; Hubbell Power Systems.
 - d. Oldcastle Precast, Inc.; Christy Concrete Products.
 - e. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers as called for on plans.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation; Hubbell Power Systems.
 - d. NewBasis.
 - e. Nordic Fiberglass, Inc.
 - f. Oldcastle Precast, Inc.; Christy Concrete Products.
 - g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
 2. Standard: Comply with SCTE 77.
 3. Color of Frame and Cover: Green.
 4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
 5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 7. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Hand hole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC IMC.
 2. Concealed Conduit, Aboveground: GRC IMC.
 3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC (as shown on the Plans), direct buried or concrete encased as shown on the Plans.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT with compression couplings and fittings.
 2. Exposed, Not Subject to Severe Physical Damage: EMT with compression couplings and fittings.
 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 5. Damp or Wet Locations: GRC or IMC.
 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate 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.
 3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- 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.

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 26 05 29 "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. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from RNC, Type EPC-40-PVC, to GRC or IMC before rising above floor.
- 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. 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.
- N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- O. 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.
- P. 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.
- Q. 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.
- R. 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.
- S. 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.
- T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- U. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.

- c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
- 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
- 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- V. 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.
- W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.
- 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.
- Z. Locate boxes so that cover or plate will not span different building finishes.
- AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- CC. Set metal floor boxes level and flush with finished floor surface.
- 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 civil specifications for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in civil specifications
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 civil specifications
4. 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.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Electrical Identification."

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.

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 26 05 44 "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 architectural specifications for Through-Penetration Firestop Systems."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.

26 05 33 - 12 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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

26 05 44 - 1 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. Architectural specifications for "Through-Penetration Firestop Systems" 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.

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.
- 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:

26 05 44 - 2 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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: Subject to compliance with requirements, provide products by the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM 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 GROUT

- A. Description: Non-shrink; 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.

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:

26 05 44 - 3 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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 architectural specification section for "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.

END OF SECTION

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. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- 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. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.

- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 FLOOR MARKING TAPE

- A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.4 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.

2.5 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.6 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- B. Nameplate color and information required on nameplate as shown on the Plans.

2.8 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.

- D. Attach signs and plastic labels with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line 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.
- H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Fire Alarm System.
 - 3. Power feeders
 - 4. Intercom System
 - 5. Sound Systems
 - 6. IT Systems
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder, and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Phase A Neutral: White, Black stripe.
 - 5) Phase B Neutral: White, Red stripe.
 - 6) Phase C Neutral: White, Blue stripe.

- c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Phase A Neutral: White/Gray, Brown stripe.
 - 5) Phase B Neutral: White, Gray, Orange stripe.
 - 6) Phase C Neutral: White/Gray, Yellow stripe.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.
- G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- 1. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
- 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.

- K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- L. 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.
- M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment (in equipment rooms): Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
 - b. Indoor Equipment (in finished spaces): Engraved, laminated acrylic or melamine label, secured to inside of door. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
 - c. Outdoor Equipment: Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage
 - d. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - e. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 - 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchboards.
 - e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - f. Emergency system boxes and enclosures.
 - g. Enclosed switches.
 - h. Enclosed circuit breakers.

- i. Enclosed controllers.
- j. Variable-speed controllers.
- k. Push-button stations.
- l. Power transfer equipment.
- m. Contactors.
- n. Remote-controlled switches, dimmer modules, and control devices.
- o. Battery-inverter units.
- p. Monitoring and control equipment.
- q. UPS equipment.

END OF SECTION

1.1 SCOPE

- A. The contractor shall furnish short-circuit and protective device coordination studies. Studies shall be prepared by a licensed professional engineer in the state of Alabama.
- B. The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E -*Standard for Electrical Safety in the Workplace*. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2012, the IEEE *Guide for Performing Arc-Flash Calculations*.
- C. The scope of the studies shall include existing and new distribution equipment.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract.

1.3 REFERENCES

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
 - 2. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
 - 3. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
 - 4. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
 - 5. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
 - 6. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations
- B. American National Standards Institute (ANSI):
 - 1. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
 - 2. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
 - 3. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
 - 4. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
- C. The National Fire Protection Association (NFPA)
 - 1. NFPA 70 -National Electrical Code, latest edition
 - 2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.4 SUBMITTALS FOR REVIEW/APPROVAL

- A. The studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

1.5 SUBMITTALS FOR CONSTRUCTION

- A. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input and output data. Electronic PDF copies of the report shall be provided upon request.
- B. The report shall include the following sections:
 - 1. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
 - 2. Short-Circuit Methodology Analysis Results and Recommendations
 - 3. Short-Circuit Device Evaluation Table
 - 4. Protective Device Coordination Methodology Analysis Results and Recommendations
 - 5. Protective Device Settings Table
 - 6. Time-Current Coordination Graphs and Recommendations
 - 7. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
 - 8. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
 - 9. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

1.6 QUALIFICATIONS

- A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
- B. The Registered Professional Electrical Engineer shall be licensed in the state of Alabama.

- C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

1.7 COMPUTER ANALYSIS SOFTWARE

- A. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program or approved equal.

PART 2 PRODUCT

2.1 STUDIES

- A. The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies.

2.2 DATA

- A. Contractor shall furnish all data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- B. Source combination may include present and future motors and generators.
- C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or Contractor.
- D. If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT ANALYSIS

- A. Transformer design impedances shall be used when test impedances are not available.
- B. Provide the following:
 - 1. Calculation methods and assumptions
 - 2. Selected base per unit quantities
 - 3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
 - 4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types,

transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.

5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
 6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.
- C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.
- D. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings
 2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
 3. The Power System Engineer shall notify Owner in writing, of any circuit protective devices improperly rated for the calculated available fault current.

2.4 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

- A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.
- B. Include on each TCC graph, a complete title with descriptive device names.
- C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
- D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
- E. Plot the following characteristics on the TCC graphs, where applicable:
 1. Electric utility's overcurrent protective device
 2. Medium voltage equipment overcurrent relays
 3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
 4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
 5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
 6. Medium voltage conductor damage curves
 7. Ground fault protective devices, as applicable
 8. Pertinent motor starting characteristics and motor damage points, where applicable
 9. Pertinent generator short-circuit decrement curve and generator damage point
 10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:

1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. The Power System Engineer shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.5 ARC FLASH HAZARD ANALYSIS

- A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04)
- B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.
- D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.
- E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations
- F. The short-circuit calculations and the corresponding incident energy calculations

for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

- G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
 - 1. Fault contribution from induction motors should not be considered beyond 5 cycles.
- H. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.
- I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
- J. Miss-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.
- K. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.
- L. Provide the following:
 - 1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-

- protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
- 2. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
- 3. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 EXECUTION

3.1 FIELD ADJUSTMENT

- A. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.
 - Field adjustments to be completed by the Power System Engineer under the separate Startup and Acceptance Testing contract portion of project specifications.
- B. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

3.2 ARC FLASH LABELS

- A. The Power System Engineer shall provide a 4.0 in. x 4.0 in. Brady thermal transfer type label of high adhesion polyester for each work location analyzed.
- B. The labels shall be designed according to the following standards:
 - 1. UL969 – Standard for Marking and Labeling Systems
 - 2. ANSI Z535.4 – Product Safety Signs and Labels
 - 3. NFPA 70 (National Electric Code) – Article 110.16
- C. The label shall include the following information:
 - 1. System Voltage
 - 2. Flash protection boundary
 - 3. Personal Protective Equipment category
 - 4. Arc Flash Incident energy value (cal/cm²)
 - 5. Limited and Restricted Approach Boundaries
 - 6. Study report number and issue date
- D. Labels shall be printed by a thermal transfer type printer, with no field markings.
- E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
 - 1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.

2. Wall Mounted Equipment – Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

3.3 LABEL INSTALLATION

- A. Labels shall be field installed by the Power System Engineer. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

END OF SECTION

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. Photoelectric switches.
 - 3. Indoor occupancy sensors.
- B. Related Requirements:
 - 1. Section 26 27 26 "Wiring Devices" for wall-switch occupancy sensors, digital time switches and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Intermatic, Inc.
 - 2. SensorSwitch
 - 3. Leviton Mfg. Company Inc.
- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Contact Configuration: SPST.

3. Contact Rating: 20-A ballast load, 120-277-V AC.
4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
5. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Leviton Mfg. Company Inc.
 4. Sensor Switch, Inc.
 5. Lutron, Inc.
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
 1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..

2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
 1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Leviton Mfg. Company Inc.
 4. Lutron Electronics Co., Inc.
 5. Sensor Switch, Inc.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor Tag WS1:
 1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.

2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
6. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 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 26 05 19 "Low Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. 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.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 26 05 53 "Electrical Identification."
 1. Identify controlled circuits in lighting contactors.
 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and dead-band controls to suit Owner's operations.

3.6 DEMONSTRATION

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for networked lighting control systems specified in Section 26 09 25 "Lighting Control System".
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- A. The intent of this set of specifications is to provide a complete, functional, intelligent, low-voltage lighting control system for the control of incandescent, low-voltage, LED, neon, cold cathode, fluorescent, and HID lighting sources.
- B. Where shown in the drawings, the contractor shall furnish and install a complete low-voltage lighting control system consisting of, but not limited to, relays, contactors, controllers, enclosures, switch stations and miscellaneous components as required for a complete, operational lighting control system.
- C. Where applicable standards have been established, all items of equipment, individual components, and installation methods shall meet the requirements of these standards, including, but not limited to, Underwriter Laboratories, the National Electrical Code, Federal Communications Commission, and any local or state codes that may be applicable.
- D. The products specified herein are those of Intelligent Lighting Controls, Inc. Low voltage lighting control systems manufactured by the following manufactures shall be considered providing they meet the requirements of these specifications and provide the quality and performance specified herein.
 - 1. Intelligent Lighting Controls, Inc.
 - 2. N LIGHT
 - 3. Products by listed manufacturers are subject to compliance with specified requirements.
- E. Listing of a manufacturer as acceptable does not in any way relieve the contractor from the responsibility for providing a lighting control system that meets all the requirements of these specifications.
- F. All manufacturers shall submit to the specifying engineer a line-by-line compliance comparison between each specification requirement and the system being proposed.
- G. Any ambiguities in the drawing or specification shall be brought to the attention of the specifying engineer for clarification.

1.2 QUALITY ASSURANCE

- A. Factory Assembly:** All relays, contactors, controllers, enclosures, switch stations and miscellaneous components shall be factory assembled and tested. All system

components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and low-voltage control stations and/or network terminations. All connections shall be made to clearly and permanently labeled termination points. Systems that require field assembly shall not be acceptable.

- B. Manufacturer:** A minimum of 20 years' experience in the design and manufacture of lighting control equipment.
- C. Component Testing:** All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.
- D. NEC Compliance:** All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.
- E. NEMA Compliance:** All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
- F. UL Approval:** All applicable equipment shall be UL listed under section 916 and shall bear labels indicating compliance.
- G. FCC Emissions:** All applicable equipment shall comply with FCC emissions standards specified in Part 15 and Part 68 where applicable, for commercial applications and shall bear labels indicating compliance testing. Equipment that does not meet these standards shall not be acceptable.

1.3 SUBMITTALS

- A.** The manufacturer shall provide an electronic copy of submittal drawings and data for approval prior to beginning manufacture of equipment.
- B.** Hard copy submittal package shall be provided upon request.
- C.** Submittal package shall include, but not be limited to, the following. Submittals that do not contain all the information listed below will not be considered for approval.
 - 1.** Specifications Compliance: Submit a line-by-line comparison that describes the differences between each specifications requirement and the equipment/systems being proposed. The comparison shall include a complete listing of how the proposed equipment/systems differ from that specified with regard to size, quantity, quality, a method of control, features and functions, control software functions and installation requirements.
 - 2.** System Description: Supply as part of the submittal package a brief description of the lighting control system's major features and functions.
 - 3.** Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.
 - 4.** Product Data Sheets: Provide as part of the submittal package detailed product data sheets for all major system components.
 - 5.** Riser Drawing: Provide as part of the submittal package a system riser drawing of sufficient detail to indicate the relative placement of major system components and the required connections between each. Drawings shall be project specific. Generic or typical riser diagrams shall not be acceptable.
 - 6.** Control Schedules: Provide as part of the submittal package a complete control schedule spreadsheet for relay panels, Timers, Inputs, Groups, and Presets.
 - 7.** Switch Details: Provide as part of the submittal package complete switch details including color, gangs, buttons, plate style, plate colors, and engraving.
 - 8.** Warranty: Provide as part of the submittal package a complete written warranty.

1.4 WARRANTY

- A. Manufacturer's Warranty:** Manufacturer shall provide a written warranty that shall cover all lighting control equipment. The manufacturer shall agree to repair or replace any equipment that fails due to material or workmanship for a period of 6 years.
- B. Relay Warranty:** Manufacturer shall provide a separate written warranty that shall cover all lighting control relays within the lighting control system. The manufacturer shall agree to replace any relay that fails due to material or workmanship for a period of 6 years.
- C. Warranty Period:** The warranty period shall begin after the completion of the installation and the systems field-start-up and training. Systems not provided with a field-start-up begins upon receiving of the product.

PART 2 – PRODUCTS

2.1 LIGHTLEEDER PROGRAMMABLE LIGHTING CONTROL PANELS

A. Hardware Features:

1. **Controller Back-Box:** Each programmable lighting controller shall be provided with a factory furnished; UL listed NEMA 1 enclosure designed for wall mounting. Backbox must be capable of being shipped ahead of controller chassis insert to allow for rough-in of all electrical connections prior to receipt of the controller chassis insert.
2. **Controller Chassis Insert:** Each programmable lighting controller shall be provided with a factory or field installable controller chassis insert. Controller chassis insert shall contain all controller electronics, power supplies, relays, contactors and other required components. Controller chassis inserts shall arrive at the project site completely pre-wired and require only the connection of lighting circuits and control devices.
3. **Line Voltage / Control Voltage Separation:** Each programmable lighting controller shall be provided with a mechanical barrier that separates all line voltage components and wiring from all control voltage components and wiring. An additional barrier may be installed within the line voltage section that shall provide isolation between normal and emergency circuits where required.
4. **Controller Covers:** Each programmable lighting controller shall be provided with a dead front screw-held or hinged locking cover that is designed for either surface or flush mounting. If a hinge locking door is provided, it shall be provided with a slam-latch with 2 keys and door hooks to assist in mounting.
5. **Controller Capacity/Configurations:** Controllers shall be available in sizes to accommodate 4, 8, 16, 24, 32, 40, 48, 56, and 64 relay outputs. Controllers shall be available with the electronics in the center and voltage dividers with the lighting relays on the right and left sides.

B. Electrical:

1. **Controller Power Supply:** Each programmable lighting controller shall be provided with a dual-rated, UL listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.

2. Connections: All connections shall be made to clearly and permanently labeled termination points.

C. Controller Electronics:

1. Controller CPU: Each programmable controller shall be provided with a CPU (Central Processing Unit) that shall provide all the programming and control functions for the entire controller.
2. Real-Time Clock: Each controller shall be provided with a Real-Time Clock used to perform all time-controlled functions. It shall use a high voltage line-sync circuit for timing and a crystal for backup. Clock accuracy shall be held +/- 2 minutes per year and displayed to the second with the line-sync setting. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight saving time and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 45 days without power of any type. Daylight Saving Time shall be adjustable with an enable/disable feature. Systems relying on a single clock device shall not be acceptable.
3. Relay Driver Module: Relay output cards shall be provided to expand the controller capability from 8 to 64 relay outputs in increments of 8. Electronics shall feature surge protection and optic-isolation. It shall also provide an interface for mounting input boards.
4. Relay Control Switches: Controller shall contain push-button switches to turn all relays ON or OFF without the presence of any programming.
5. Backup and Restore: The controller shall be equipped with an internal memory backup and restore capability. It shall have the ability to backup all internal programming into additional onboard memory, verify present programming with backup, and restore programming.
6. Runtime Logging: The controller shall be equipped with memory to log the runtime of each relay. It shall be capable of storing up to 30 days or 1092 hours of data and be able to be exported in a delimitative format.
7. Non-Volatile Memory: Controller shall contain a minimum of 4 Mb of nonvolatile EEPROM memory with a data retention of >200 years and electrostatic discharge protection of >4000V.
8. Power Input Surge Suppression: The controller's 24VAC power input shall be equipped with double surge suppression to protect the electronics from transient over-voltages. Protection shall clamp over-voltages up to 123 volts.

9. Data Line Surge Suppression: The controller data line communications shall be equipped with transient voltage suppression protection that will protect the electronics from electrostatic discharge and other transient over-voltages. Protection shall clamp transients up to 8kv direct discharges and 15kv air discharges.
10. Data Line Communications: The controller shall be equipped with serial communications through RJ45 connectors for communicating on CAT-5 cable with other panels and LightSync devices. It shall also be equipped with a separate local port for communicating with LightSync devices. The communications shall consist of 2-RS485 data lines.
11. USB Serial Communications: A USB port shall be provided for programming and interfacing the system with the use of a personal computer.
12. TCP/IP Communications: A TCP/IP port shall be provided for programming and interfacing the system with a personal computer over a network (LAN) or the internet (WAN).
13. Optional Module Interface: The controller shall contain 4 ports for interfacing optional modules which include communications and power. Optional modules shall be able to be mixed on each controller.

D. Switching and Control Devices:

1. Device Node Capacity: The lighting controller shall support switch input control of up to 64 data line LightSync devices locally per panel and 254 per network for up to 16,510 devices. The first 8 device nodes shall be powered by the lighting controller. The addition of a power supply or power supply/repeater shall be required for each additional 20 device nodes. Each LightSync device shall have a unique address and shall be capable of being programmed to the applicable functions described in the Switched Input Types heading in this specification.
2. Data Line Media: The data line shall consist of RS485 communications protocol transmitted over CAT-5, CAT-5E, or CAT-6 Cable. The cable shall have male RJ45 connectors installed on each end for interfacing controllers and LightSync devices. Both daisy chain and "T" (3 direction branching) of cable runs shall be permitted. "T" branching shall be accomplished by the addition of power supply/repeaters. It shall be able to be wired in a home run configuration for LightSync devices by the addition of a LightSync Hub.

3. LightSync Switch Stations: LightSync data line switch stations shall be available in momentary push button (1-6 switches and pilots) and each switch shall have an associated pilot light. Each button shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. There shall be an option to program each pilot LED to indicate the state of any relay, Group, Preset, and static on or off. It shall also have the capability to reverse the status: LED is ON if the relay is OFF etc.
4. LightSync Photocell Controllers: The photo controller shall be provided with 256 light to dark levels (0-1800fc). It shall allow selection of 8 individual set points for OFF and ON and includes a selectable range of dead-band. It shall be programmable for 2 or 30 seconds delay. Each set point shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network.
5. LightSync Input Modules: The input module shall provide 4 inputs that accept momentary, momentary PB and maintained switch closures. Each input shall be optically isolated and have the ability to accept dry contact closures or 12-24VDC signals. Each input shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. It shall provide four pilot outputs that provide the true status of relays, groups and presets. It shall be installed in the control panel or remote mounted.
6. LightSync Disable Key Switch: The disable switch shall provide an RJ45 connector that shall disable all LightSync devices down line with the closure of a key switch. It shall also provide two RJ45 connectors to pass data through. It shall indicate with an LED when the disable switch is active.
7. LightSync Occupancy Sensor Input Module: The occupancy sensor input module shall provide power and inputs for motion sensors. It shall have 4 or 8 independent inputs that shall be able to interface multiple sensors. Each input shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. It shall be installed in the control panel or remote mounted.
8. LightSync 0-10V Dimmer Output Module: The 0-10VDC dimmer output module shall be designed to control dimmable ballasts or other 0-10VDC devices. Each module shall have 4 independent output channels that can control up to 200 devices per output at .5mA per device. It shall have the capability to vary its level 256 steps between 0 and 10VDC. It shall be able to respond to photo controllers, switch inputs, DMX512 signals, and timers. Each output shall be galvanically isolated up to 1500V to protect electronics. It shall be installed in the control panel or remote mounted.

9. LightSync Motor Control Output Module: The motor control output module shall be designed to control shade motors, louver motors, blind motors, skylights, or any other class 2 DC motors. Each module shall have 4 independent outputs that can be controlled by a switch input, photocell, or timer. The control time shall be selectable from .1 to 300 seconds. Each lighting controller shall handle up to 8 modules with 4 outputs on each. Each output shall be equipped with a limit switch input for each direction of the motor.
 10. Graphical Touch Screen Control Station: The Touch screen control station shall display the status and control the lighting control panel relay outputs via pre-programmed control objects on standard or custom bitmap screens.
- E. Special Purpose Modules: The following special purpose controller nodes shall be available. Multiple modules shall be permitted per controller.
1. BACnet Control: This module shall communicate directly to the lighting controller through serial communications from the BAS system using BACnet MSTP or BACnet IP protocol. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.
 2. DMX Control: This module shall support the control of relays using standard USITT DMX512 protocol used by theatrical lighting systems. Each relay in the lighting panel shall be configured to be controlled by any DMX channel. It shall contain a frame filter that can be set from 1 – 16 frames. It shall have a priority setting for switch inputs or DMX signals. It shall have the capability to control any 0 – 10V dimming output throughout the network. It shall display current DMX levels from the keypad.
 3. DMX Driver: This module shall send DMX signals from the lighting control panels using standard USITT DMX512 protocol used by theatrical lighting systems. Each module added to the panel shall control up to 64 channels. Each dimming output channel shall be able to be mapped to 1-512 DMX channels. It shall be 1 to 1 mapped or programmed with free software. It shall be installed in the control panel or remote mounted.
 4. Modbus Control: This module shall communicate directly to the lighting controller through RS485, RS232, or TCP serial communications from the BAS system using Modicon Modbus RTU or ASCII protocol. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.

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LIGHTING CONTROL SYSTEM

5. N2 Control: This module shall communicate directly to the lighting controller through serial communications from the BAS system using Metasys-N2 protocol. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.
 6. LonWorks Control: This module shall communicate directly to the lighting controller through serial communications from the LonWorks network. It shall be able to read the status of inputs and relays and control single or multiple relays in the lighting controller. It shall also be able to disable/enable inputs and shall be able to force timer options.
 7. Modem Control: This module shall allow communications over an analog telephone line to provide programming and status of the lighting control panel.
 8. Protocol Input Control: This module shall allow serial communications from a Modbus, N2, BACnet, or LonWorks network. It shall be capable of emulating LightSync switches or photocells for direct control and status of relays, dimmers or motor controls.
 9. DTMF Telephone Control: This module shall support Input Status, Relay Status and Control, Preset Control and Group Control in the lighting panel via voice prompted commands and DTMF signals from a touch-tone telephone.
- F. Programming: Programmable controllers shall be capable of being programmed, monitored, backed-up, or controlled through any of the below methods. All programming changes shall take effect immediately as they are programmed and shall not suspend or disable switches or other system functions. The same functions shall be available for any of the connection types.
1. Local Keypad and Display: The system user shall be able to program, monitor and control any of the controller features and functions through the use of simple menu-driven self-prompting user interface consisting of a 4-line 20-character backlit LCD display and 8 selection keys that change function based on the current operating mode.
 2. USB Serial Direct Connect: The system user shall be able to program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a USB port from a PC.
 3. Modem Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer

Pro Windows-based graphical user interface software using a PC/modem on an analog phone line.

4. TCP/IP Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC with TCP/IP on a LAN or WAN.

G. Diagnostics: Programmable controllers shall have the ability to do the following diagnostics.

1. Power Status: Each programmable lighting controller shall be provided with an LED on the controller and each output board that shall indicate that power is present.
2. Keypad: System users shall be able to view thru the keypad the current status of any relay, input, group, or preset and force any ON or OFF.
3. Software: System users shall be able to view thru the LightLEEDer Pro software the current status of any relay, input, group, or preset and force any ON or OFF. It shall also have the ability to scan the network for devices and controllers and then poll them to verify network quality.
4. Relay Cycle Test: The controller shall have a cycle test for relays to turn them off/on/off and then return them to the original state to verify proper operation. It shall display the results for each relay for turning the relay ON and OFF.
5. Device Finder: It shall have the capability through the keypad to find LightSync devices, dimmer devices, and motor devices on the network.
6. Switch Test Mode: It shall be able to enter a switch test mode, where a switch input status LED will light when switch inputs are activated. It shall disable normal control when in this mode.
7. Demo Clock: It shall have the ability to speed the clock's time by 10, 30, or 60 times for testing timer functions.

- H. Power Failure and Power-Up: Each programmable lighting controller shall be provided with circuitry that shall automatically shut down the controller whenever the incoming power fails to be delivered to the controller within required limits. When power is returned to the controller, one of the following power-up modes will be implemented for each controlled relay output in the system.
1. No Action: Upon restoration of incoming control power, the controller electronics shall be restarted and resume normal operations and all circuits will be maintained in the condition they were last in.
 2. Turn ON: Controller shall turn the selected relay output to the ON state after power-up.
 3. Turn ON if Input Closed: Controller shall turn the selected relay output to the ON state after power-up if local input selected is closed. It shall be able to select any input to monitor.
 4. Turn OFF: Controller shall turn the selected relay output to the OFF state after power-up.
 5. Turn OFF if Input Closed: Controller shall turn the selected relay output to the OFF state after power-up if local input selected is closed. It shall be able to select any input to monitor.
 6. On if Open Time, OFF if Closed Time: Controller shall turn the selected relay output to the ON state during Open hours and shall turn selected relay outputs to the OFF state during Closed hours. This shall be used in conjunction with OPEN/CLOSED timers.
 7. OFF if Open Time, ON if Closed Time: Controller shall turn the selected relay output to the OFF state during Open hours and shall turn selected relay outputs to the ON state during Closed hours. This shall be used in conjunction with OPEN/CLOSED timers.
 8. Time of Day: Controller shall turn the selected relay output to the ON or OFF state based on the time of day in 30-minute increments for every day of the week.
- I. True Relay Status Feedback: Each controller shall be provided with circuitry that shall monitor the actual current status of each relay via a set of pilot contacts mechanically linked to the relay main contacts.

J. Switch Input Details: All switch inputs shall have the following options:

1. Input Flexibility: Each switch input shall accept a 2 or 3 wire maintained or momentary switch. It shall be capable of accepting a dry contact, open collector closure, or a 12-24VDC signal. Each switch shall be able to have 2 switch types associated with it in an A/B form.
2. Input to Output Programmability: Any switch input shall be programmed to control any or all of the controller's relay outputs without limitations in the network.
3. Input Logic Conditionals: All switch inputs shall have 2 conditionals that add a logic "AND" or "OR" dependent on a relay on, a relay off, an "on" input opened or closed, and an "off" input opened or closed. It shall also have a priority level setting.
4. Input Active Times: All switch inputs shall have a time-of-day or open/close time of action. This shall change the switch type on the time of day for every 30 minutes or change per open/closed times.
5. Input Types:
 - a) Momentary ON/OFF: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON. When momentary contact is made between OFF and COM, relay outputs controlled by this input shall be turned OFF.
 - b) Momentary ON/OFF w/Blink: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON. When momentary contact is made between OFF and COM, relay outputs controlled by this input shall blink and postpone being turned OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice prior to turning OFF. If an ON command is received during the blink alert time, relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
 - c) Momentary Push-Button ON/OFF: When momentary contact is made between the ON and COM, relay outputs controlled by this input are turned ON and OFF alternately, based on current state, each time contact is made.

- d) Momentary Push-Button ON: When momentary contact is made between the ON and COM, relay outputs controlled by this input shall be turned ON.
- e) Momentary Push-Button OFF: When momentary contact is made between ON and COM, relay outputs controlled by this input shall be turned OFF.
- f) Momentary Push-Button Toggle: When momentary contact is made between ON and COM, relay outputs controlled by this input shall toggle from the present state.
- g) Maintained ON/OFF: When contact is made between the ON and COM, relay outputs controlled by this input are turned ON. When contact is broken between ON and COM, relay outputs controlled by this input are turned OFF.
- h) Maintained Multi-way: When contact is either made or broken between the ON and COM, relay outputs controlled by this input will be toggled between ON and OFF conditions. This function shall be similar to that of standard 3 and 4-way switches.
- i) Maintained ON/OFF w/Blink: When contact is made between the ON and COM, relay outputs controlled by this input are turned ON. When contact is broken between ON and COM, relay outputs controlled by this input shall blink and postpone being turned OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice prior to turning OFF. If an ON command is received during the blink alert time, relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
- j) Timed ON: The timed-ON input shall operate either from the input closure or open. If programmed to operate from the closure, the relays turn ON when the input closes and turn OFF after the time duration. The relays do nothing when the input opens. If programmed to operate from the open, the relays turn ON when the input closes and remain ON. When the input opens, the relays turn OFF after the timed-ON duration.
- k) HID Bi-Level: This feature requires the configuration of ON/OFF relay outputs and HI/LOW relay outputs. The first momentary contact between ON and COM sets the ON relay outputs to ON and the HI/LOW outputs to HI (for at least 15 Minutes). The second contact

switches the HI/LOW outputs to LOW. Additional contact closures will toggle the HI/LOW relay outputs. The cycle then repeats until momentary contact is made between switch input OFF and COM. then the ON/OFF outputs and HI/LOW outputs are turned OFF.

- l) Two-Step Alternating Sequence: The first time the switch is activated, relay outputs programmed as "Group A" are turned ON and relay outputs programmed as "Group B" are turned OFF. The second time the switch is activated, "Group A" relay outputs are turned OFF and "Group B" relay outputs are turned ON. The third time the switch is activated, the pattern begins again at step one.
 - m) Four-Step Alternating Sequence: The first time the switch is activated, relay outputs programmed as "Group A" are turned ON and relay outputs programmed as "Group B" are turned OFF. The second time the switch is activated, "Group A" relay outputs are turned OFF and "Group B" relay outputs are turned ON. The third time the switch is activated; both "Group A" and "Group B" relay outputs are turned ON. The fourth time the switch is activated; both "Group A" and "Group B" relays are turned OFF. The fifth time the switch is activated, the process begins again at step one.
 - n) Set Preset: When momentary contact is made between the ON and COM, the selected preset scene will be activated.
 - o) Force Timer: When momentary contact is made between the ON and COM, the selected timer will be activated.
- K. Timer Functions: Each of the programmable lighting controllers shall have the described timer options listed below for the relay outputs.
- 1. Time of Day Timers: Each programmable lighting controller shall be provided with a minimum of 128 available timers (scheduled events) for use in developing time-of-day automated schedules. Each timer shall have the ability to turn any or all relay outputs ON or OFF at any time in 1-minute increments. Timers shall be day-of-week selectable and may be programmed to activate on any combination of days of the week. Each shall be capable of being programmed to be enabled or disabled for any day of the calendar year.
 - 2. Astronomical Scheduling: Each controller shall contain an astronomical time clock that shall calculate sunrise and sunset times based on the geographical latitude and longitude positioning. Sunrise and sunset times may be used as activation times for any system timer. In addition to sunrise and sunset time activation, the control shall be capable of programming activation time before and after these times based on an offset of 1-999 minutes.

3. Open/Closed Time Control: The user shall also have the option of controlling relay outputs in relation to the Open/Closed times of the facility. The Open/Closed times may vary for different days of the week and may be programmed for each day of the year. In addition to Open/Closed time activation, the control shall be capable of programming activation time before and after these Open/Closed times based on an offset of 1-999.
 4. OFF Hour Sweeps: The system shall also support after hours OFF sweeps of selected relay or groups of relays at user defined one, two, or three-hour intervals.
- L. Relay Output OFF Options: Each relay shall have the option to control the relay OFF in a certain way other than the default OFF.
1. Single Blink Alert: Each relay output within the programmable lighting controller shall be individually programmable to blink and postponed prior to being turned OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice prior to turning OFF with a timer OFF sweep to warn occupants of the upcoming OFF event. If an ON command is received during the blink alert time, the relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
 2. Double Blink Alert: Each relay output within the programmable lighting controller shall be individually programmable to blink and postponed prior to being turned OFF and then blinked 1 minute before turning OFF. The alert time shall be programmable from 2 to 99 minutes. The blink alert function shall blink each relay twice for each alert to warn occupants of the upcoming OFF event. If an ON command is received during the blink alert time, the relay output shall be overridden and left ON for the override time. Override times shall be adjustable from 5 to 999 minutes in 1-minute increments.
 3. HID Delay: Each relay output within the programmable lighting controller shall have the ability to be controlled like a Single Blink Alert as described above but without the blink alert to prevent damage to HID lamps.
 4. Alarm ON: Relays shall be capable of performing a momentary ON function. The ON function shall be programmable from 1 to 99 seconds.
 5. Alarm OFF: Relays shall be capable of performing a momentary OFF function. The OFF function shall be programmable from 1 to 99 seconds.

6. Alarm Pulsed ON: Relays shall be capable of being cycled ON and OFF at 1-second intervals and returning to the OFF state. It shall be programmable from 1 to 90 seconds.
 7. Alarm Pulsed OFF: Relays shall be capable of being cycled OFF and ON at 1-second intervals and returning to the ON state. It shall be programmable from 1 to 90 seconds.
 8. Automatic Control Switch-OFF: Relays shall be capable of being cycled OFF for 5 seconds and then returned to the ON state for controlling Sentry or AS110 switches.
 9. Automatic Control Switch-Blink: Relays shall be capable of being cycled OFF for 1.5 seconds and then returned to the ON state for controlling Delay-OFF mode on AS110 switches.
- M. Presets: The lighting controller shall support up to 256 user-defined presets of ON/OFF relay patterns. The presets shall be invoked by a switch or timer actuation.
- N. Descriptive Names: The system shall support the optional assignment of descriptive names (up to 10 characters) to the lighting controller, relay outputs, relay groups, inputs, timers, and presets. These names shall be able to switch from custom names to default names.
- O. Password Protection: Each Programmable controller shall have user definable 6 digit alphanumeric passwords with 2 levels of access. It shall have control and edit for level 1 and control only access for level 2.
- P. Networking:
1. Network Capacities: In addition to the data line devices mentioned in Section D, LightLEEDer Controllers shall be linked together on the data line to form a Local Area Network (LAN) of up to 254 controller nodes.
 2. Network Features: The basic network manager shall allow connection of up to 254 controllers and 254 data line devices (on top of the 64 devices per panel) and provide USB communications. The advanced network manager shall have a high-speed LightSync scanner, 4 gateway device ports, power for LightSync devices, and TCP/IP along with the items in the basic network manager.
 3. Network Universe: The network of panels shall be capable to connect to other networks over a network (LAN) or over the internet (WAN) to interconnect multiple systems.

4. Network Gateway: The following special purpose gateways shall be available and provides network wide control from a single point for its specialized function:
 - a) DTMF Telephone Control: The telephone gateway shall support the control of relays, presets and groups on the network via voice prompted commands and DTMF signals from a touch-tone telephone.
 - b) DMX Control: The DMX gateway shall support the control of relays on the network from a single point connection using standard USITT DMX512 protocol used by theatrical lighting systems.
 - c) Modbus Control: The Modbus gateway shall support communications from the BAS system using Modicon Modbus protocol from a single point connection. All network input status, relay status, and control shall be supported.
 - d) N2 Control: The N2 gateway shall support communications from the BAS system using a Metasys-N2 protocol from a single point connection. Network wide group status and control shall be supported.
 - e) BACnet Control: The BACnet gateway shall support communications from the BAS system using BACnet MSTP or BACnet IP protocol from a single point connection. It shall allow up to 500 single relays, 100 multiple relays, 48 groups, and 48 presets.
 - f) LonWorks Control: The LonWorks gateway shall support communications from the BAS systems using LonWorks protocol from a single point connection. It shall allow up to 200 single relays, 100 multiple relays, 48 groups, and 48 presets.
5. BAS System / Lighting Control System: Programmable lighting controllers integrated/interfaced to other building control and alarm systems must remain completely functional and continue to process all programmed commands, including time schedules and local switching.

- Q. Runtime Logging and Trending: Each lighting control panel shall be capable of logging Runtime and Trending data for each relay. This data shall be able to be harvested and exported from the entire system.
1. Runtime Logging: The controller shall be able to internally log the runtime of each relay for up to 30 days. This data shall be able to be harvested with a personal computer at 1-minute intervals.
 2. Logging and Trending Software: Runtime Logging and Trending software shall be available for harvesting data from the lighting control panels. It shall have a dedicated personal computer connected to the system through a LAN or USB cable to the panel or network controller.
 - a) Load Configuration: Each relay in the system shall be able to have a wattage load assigned to it to represent the actual load on the relay. Loads shall be able to be named, or names shall be exported directly from the system programming software.
 - b) Combined Loads: Up to 254 combined relay loads shall be allowed, for total wattage recording of areas in the facility. The combined loads shall allow relays from any panel in the network. Combined loads shall be able to be named for identification in reports and graphs.
 - c) Daily or Monthly Usage Report: The software shall be capable of generating spreadsheet reports in a daily or monthly format for each relay or combined relays in the system.
 - d) Export Data: The compiled reports shall be able to be exported to a .csv (comma separated value) file. These files when exported shall be coded for the year, month, and date.
 - e) Daily or Monthly Usage Graphs: The software shall be capable of generating usage graphs in a daily or monthly format for each relay or combined relays in the system.
 - f) Printing: Daily or monthly usage graphs shall have the capability to be directly printed from the software.
 - g) Live Usage Graphs: The software shall have 1 to 9 live usage meter dials to display the present wattage of combined loads.

LL-EVO DISTRIBUTED LIGHTING CONTROLLER:

- A. LL-EVO Distributed Lighting Controller: Each controller shall be designed to be remotely installed and provide control of 1-4 remote load control relays. This controller shall have the same features as the Programmable Lighting Control Panels excluding add-ons and naming.
1. Enclosure: Each controller shall be provided with a NEMA 1 galvanized steel enclosure with a removable screw cover. It shall also be provided with a 1/2" nipple for mounting directly onto a junction box and pre-drilled mounting holes.
 2. Plenum Rated: Each controller shall be suitable for plenum mounting. Controllers without this rating shall be unacceptable.
 3. Controller Power Supply: Each lighting controller shall be provided with a dual-rated, UL listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.
 4. High Voltage Connections: Each controller shall be provided with 6" color coded wire leads for terminating the high voltage connections. All connections shall be made to clearly and permanently labeled termination points.
 5. Low Voltage Connections: Controllers shall also be provided with RJ45 connectors for the data line connections and remote relays. It shall also be provided push-to-connect connectors for occupancy sensors, dimming, and photocells. All connections shall be made to clearly and permanently labeled termination points.
 6. Occupancy Sensor Inputs: It shall have 4 independent inputs, and each input shall be able to interface multiple occupancy sensors or hardwired switches. Each input shall control any or all the relays in the lighting controllers or the dimmer outputs. Each controller shall provide 24VDC total power for the occupancy sensors with the following current capabilities:
 - 200mA w/4 LightSync devices connected to controller
 - 160mA w/5 LightSync devices connected to controller
 - 120mA w/6 LightSync devices connected to controller
 - 90mA w/7 LightSync devices connected to controller
 - 60mA w/8 LightSync devices connected to controller

7. Photocell Inputs: It shall provide an integrated interface for up to 2 ILC photocell heads. The photo controller shall be provided with 256 light to dark levels (0-1800fc). It shall allow selection of 8 individual set points for OFF and ON and includes a selectable range of dead-band. It shall be programmable for 2 or 30 seconds delay. Each set point shall control any or all of the relays in the lighting controllers or the dimmer outputs.
8. Local Data Line Port: It shall provide an RJ45 data line port for up to 61 LightSync data line devices. It shall provide power for LightSync devices as described in item "f", or additional power added with an optional Power Supply Repeater.
9. Dimming: Room controllers shall be provided with 4 independent 0-10V dimming control outputs that shall sink a maximum of 100mA per output. Each output shall be galvanically isolated up to 1500V to protect the electronics. Each output will revert to 100% upon a power loss.
10. Real-Time Clock: Each controller shall be provided with a Real-Time Clock used to perform all time-controlled functions. It shall use a high voltage line-sync circuit for timing and a crystal for backup. Clock accuracy shall be held +/- 2 minutes per year and displayed to the second with the line-sync setting. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight-saving time and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 45 days without power of any type. Daylight Saving Time shall be adjustable with an enable/disable feature. Systems relying on a single clock device shall not be acceptable.
11. Pre-Configured Programs: Each controller shall have up to 16 pre-configured lighting application programs. Each lighting application program shall be selectable with a switch on the controller.

B. Remote Relays: Each distributed lighting controller shall be provided with 1-4 single pole R20 or R20D relays.

1. Remote Relay Enclosure: Each remote relay enclosure shall be made of ABS/PC plastic that is UL recognized.
2. Mounting: Each relay shall have a ½" electrical nipple for attaching to an electrical box. It shall also be provided with a ½" conduit nut for fastening.
3. Line Voltage Connections: Each relay shall be provided with 600V 6" wire leads for connection to line and load. Leads shall exit through the nipple of the relay.
4. Low Voltage Connections: It shall be provided with an RJ45 connector for interfacing and controlling the relay.
5. Latching Relay: The relay shall be a latching relay and shall not change state upon a power loss.
6. Ratings: The remote relays shall be rated for a minimum of 16 amps, and up to 347VAC. It shall be rated for resistive, general, ballast, and electronic ballast loads. It shall be able to control 1/2HP motor loads up to 120VAC.
7. 0-10V Dimming: An optional 0-10V dimming relay shall be provided, designated as R20D. Wire leads shall be provided and shall exit through the nipple of the relay. Leads shall be a minimum of 6" in length. It shall be acceptable to wire the 0-10V connection with the Class1 wiring. Each relay shall be able to sink the 0-10V dimming up to 100mA.
8. Certifications: Each relay shall be UL/CUL listed to UL916 specifications. They shall be FCC Part 15. 109, Class B approved for radiated and conducted emissions.
9. Plenum Rating: The relay shall be plenum rated and clearly marked.
10. Made in the USA: Each relay shall be Made in the USA. Relays manufactured other than the USA shall be unacceptable.

2.2 ROOM CONTROLLERS:

- A. 2-Load Room Controller: Each controller shall be designed to be remotely installed and provide 2 load control relays, 4 independent Occupancy Sensor/Hardwire inputs, 2 independent 0-10V dimming outputs, 2 photocell head inputs, and a local port for 2 data line push-button switches. The room controllers shall be able to be stand-alone or networked from an Expansion Processor or lighting control panel.
1. Enclosure: Each room controller shall be provided with a NEMA 1 enclosure with a removable screw cover. It shall also be provided with a 3/4" nipple for mounting directly onto a junction box.
 2. Control Voltage: The room controller shall be available with 120/277VAC, or 120/347VAC control voltages.
 3. Relays: Each controller shall be provided with 2 single pole Reliant40 relays de-rated to 30 Amp tungsten or ballast loads at up to 347VAC.
 4. Connections: Each controller shall be provided with 6" color coded wire leads for terminating the high voltage connections. It shall also be provided with RJ45 connectors for the data line connections and push-to connect connectors for occupancy sensors, dimming, and photocells.
 5. Occupancy Sensor Inputs: Each room controller shall provide 4 hardwire inputs that can directly interface occupancy sensors or hardwired switches. Each room controller shall provide up to 200mA @ 24VDC total power for the occupancy sensors.
 6. Photocell Inputs: It shall provide an interface for up to 2 photocell heads.
 7. Local Data Line Port: Shall provide an RJ45 data line port for up to (2) 6 push-button switches.
 8. Dimming: Room controllers shall be provided with 2 independent 0-10V dimming ballast control outputs that shall sink a maximum of 100mA per output.

- B. 4-Load Room Controller: Each controller shall be designed to be remotely installed and provide up to 4 load control relays, 4 independent Occupancy Sensor/Hardwire inputs, 4 independent 0-10V dimming outputs, 2 photocell head inputs, and a local port for 2 data line push-button switches. The room controllers shall be able to be stand-alone or networked from an Expansion Processor or lighting control panel.
1. Enclosure: Each room controller shall be provided with a NEMA 1 enclosure with a removable screw cover.
 2. Control Voltage: The room controller shall be available with 120/277VAC, or 120/347VAC control voltages.
 3. Relays: Each controller shall be provided with up to 4 single pole Reliant40 relays rated for 40 Amp tungsten or ballast loads at up to 347VAC.
 4. Connections: Each relay shall be provided with terminals for 2 line and 2 load wires. It shall also be provided with RJ45 connectors for the data line connections and push-to connect connectors for occupancy sensors, dimming, and photocells.
 5. Occupancy Sensor Inputs: Each room controller shall provide 4 hardwire inputs that can directly interface occupancy sensors or hardwired switches. Each room controller shall provide up to 200mA @ 24VDC total power for the occupancy sensors.
 6. Photocell Inputs: It shall provide an interface for up to 2 photocell heads.
 7. Local Data Line Port: Shall provide an RJ45 data line port for up to (2) 6 push-button switches.
 8. Dimming: Room controllers shall be provided with 4 independent 0-10V dimming ballast control outputs that shall sink a maximum of 100mA per output.
- C. 4-Load Expansion Panel: Each panel shall be designed to be remotely installed and provide up to 4 load control relays. It shall also provide means to mount up to 2 interface modules and 1 photocell controller. Interface modules shall include; 4 input module, 4 occupancy sensor input module, 8 occupancy sensor input module, 4 photocell sensor controller, and dimming module.
1. Enclosure: Each remote expansion panel shall be provided with a NEMA 1 enclosure with a removable screw cover.

2. Control Voltage: The remote expansion panel shall be available with 120/277VAC, or 120/347VAC control voltages.
 3. Relays: Each controller shall be provided with up to 4 single pole Reliant40 relays rated for 40 Amp tungsten or ballast loads at up to 347VAC.
 4. Connections: Each relay shall be provided with terminals for 2 line and 2 load wires. It shall also be provided with RJ45 connectors for the data line connections.
- D. Expansion Processor: Each processor shall provide the Room Controllers the full ability and all of the functions of the Programmable Lighting Control Panels. With the addition of a Network Controller, the Room Controllers shall communicate with other lighting control panels and other Room Controller subnets.
- E. Room Controller Capabilities:
1. Subnet Capability: Each Room Controller subnet shall be able to support up to 16 Room Controllers of any type.
 2. Network Wide Capability: With the addition of a Network Controller, Room Controller subnets shall reside with the Programmable Lighting Control Panels 254-panel capabilities. It shall support up to 254 Room Controller subnets for a total of 4064 panels or 16,256 control relays.
 3. Room Controllers W/Relay Panels: Room Controllers shall be allowed to be connected to a Programmable Control Panel with Relay Driver Modules and relays. For every Relay Driver Module connected to the controller, the subnet capability for the Room Controllers shall decrease by 2 panels.
- F. Room Controller Programming:
1. Stand-alone: 2 and 4 load Room Controllers shall be programmable as a standalone lighting controller. Room Controllers shall be capable of being programmed, monitored, or backed-up using the Windows-based graphical software.
 2. Networked: Room Controllers and Programmable Control Panels shall be capable of being programmed, monitored, backed-up, or controlled through any of the below methods. All programming changes shall take effect immediately as they are programmed and shall not suspend or disable switches or other system functions. The same functions shall be available for any of the connection types.

- a) Local Keypad and Display: The system user shall be able to program, monitor and control any of the controller features and functions through the use of simple menu-driven self-prompting user interface consisting of a 4-line 20-character backlit LCD display and 8 selection keys that change function based on the current operating mode.
- b) USB Serial Direct Connect: The system user shall be able to program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a USB port from a PC.
- c) Modem Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC/modem on an analog phone line.
- d) TCP/IP Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC with TCP/IP on a LAN or WAN.

2.3 LIGHTING CONTROL RELAYS:

A. Reliant40-1 Single Pole Relay

1. Listing: Lighting control relays shall be individually UL and CUL listed and shall bear labels indicating compliance.
2. Labeling: Lighting control relays shall bear labels for relay current and SCCR ratings.
3. Endurance: Lighting control relays shall be designed and tested to have a minimum cycle life of 200,000 ON/OFF cycles @ FULL LOAD and 2,000,000 ON/OFF cycles at no load.
4. SCCR: Lighting relays shall have an SCCR rating of 18,000 amps up to 347 VAC.
5. Loads: Lighting control relays shall be designed for control of 120, 277 or 347 VAC lighting control circuits at a full 40 AMPS for Tungsten or Ballast loads, 16 AMPS for Electronic Ballasts (UL limit), and motor loads of 1.5 Hp @ 120 VAC.

6. Latching: Lighting control relays shall be designed with a latching mechanism that shall hold the relay in its last activated state indefinitely, with no change of state during an interruption of power. Solid state or electrically held relays are not acceptable.
7. Auxiliary Contacts: Each Lighting control relay shall contain an auxiliary set of contacts rated at 1 AMP 30 VAC/VDC electrically isolated but mechanically linked to the main contacts for the purpose of true status monitoring and pilot light activation.
8. Mounting: Relays shall be capable of panel mounting.
9. Lock-Out: Relays shall be equipped with an Enable/Disable switch to lock out On/Off control from the controller.
10. Actuator: Relays shall be equipped with a manual actuator switch for turning the relay ON or OFF along with status indication.

B. Reliant40-2 and 3 Pole Relay:

1. Multipole: Electrical contractor shall provide quantities of 40 AMP 2 or 3 pole relays as indicated on the drawings and schedules as specified herein.
2. Labeling: 40 AMP 2 or 3 pole relays shall be individually UL and CUL listed and shall bear labels indicating compliance.
3. Voltages: 40 AMP 2 or 3 pole contactors shall be designed for the control of 208, 240 and 480 VAC lighting loads at a full 40 Amps.
4. Mechanical Link: Poles within the relay shall be electrically isolated but mechanically linked so as to open and close together without the possibility of one pole being closed while the other remains open. Systems that utilize two single-pole relays to accomplish this function are not acceptable.

2.4 SWITCH STATIONS AND COVER PLATES

- A. Hardwired Switches and Cover Plates:** Electrical contractor shall provide and install switch plates and switches of the quantities and types shown on the drawings and specified herein.

1. NFP Momentary Switch

- a) Switch:** It shall consist of a single-pole double-throw center OFF momentary switch rated at 6 Amps @ 125 VAC. They shall be available in black, white, gray, or red colors
- b) Cover Plates:** Plates shall be available in stainless steel, brushed aluminum, or painted cold rolled steel. They shall be available with 1-3 switches per single gang plate and 4-8 in a 2-gang plate.
- c) Status:** LED status indicators shall be optional for each switch provided.
- d) Nomenclature:** Engraving shall be available on phenolic labels or directly on the plate.

2. Heavy Duty Switch

- a) Switch:** It shall consist of a single-pole double-throw center OFF momentary heavy-duty toggle or Decora® paddle switch rated at 15-20 Amps @ 120/277 VAC. They shall be available in ivory or white colors.
- b) Cover Plates:** Plates shall be available for Decora® switches in ivory, white, or stainless steel with or without visible screws and come in 1-4 gangs.
- c) Nomenclature:** Engraving shall be available on phenolic labels or directly on the plate.

3. Key Switch

- a) Key Switch:** Key switch shall consist of a single-pole double-throw momentary or maintained switch. They shall be available to allow the key to being removed in the ON position or the OFF position.

- b) Cover plates: Plates shall be available in stainless steel, brushed aluminum, or painted cold rolled steel. They shall be available with 1-2 switches per gang plate and up to 4 gangs.
- c) Status: LED status indicators shall be optional for each switch provided.
- d) Nomenclature: Engraving shall be available on phenolic labels or directly on the plate.

4. Touch Activated Switch

- a) Switch: Touch activated switch shall be a momentary output solid-state piezo type push button.
- b) Cover plates: Plates shall be available in stainless steel, brushed aluminum, or painted cold rolled steel. They shall be available with 1-3 switches per gang plate and up to 4 gangs.
- c) Gasket: Cover plate neoprene gaskets shall be available for weatherproof applications.
- d) Status: LED status indicators rings shall be optional for each switch provided.
- e) Nomenclature: Engraving shall be available on phenolic labels or directly on the plate.

B. Custom Switch Plates and Graphic Switch Stations: Electrical contractor shall provide and install custom switch plates and graphical switching stations of the quantities and types shown on the drawings and specified herein.

- a) Switch Plates: Switch plates shall consist of a control panel faceplate, switches, and other control devices as required, LED pilot lights and all mounting hardware.
- b) Material: Switch plates shall be manufactured from a single piece of stainless steel, aluminum, brass or bronze, finished and labeled as per the plans and specifications or as indicated on approved drawings.
- c) Mounting: Switch plates shall be designed to mount either to a standard electrical gang box supplied by the electrical contractor for

either flush or surface mounting or to a custom back-box supplied by the manufacturer.

- d)** Nomenclature: Switch plate graphics and labeling shall be accomplished through the use of one or a combination of multi-color anodized, engraving or phenolic labels; laser etched or painted graphics.
- e)** Graphics: Each switch station shall contain a graphic representation of the controlled space with switches and other control devices graphically located on the station so as to indicate their associated areas of control.

PART 3 – EXECUTION

3.1 INSTALLATION

1. Installation: Where shown in the drawings, the contractor shall furnish and install programmable lighting controllers of the quantities, sizes, and types shown on the drawings or specified herein.
2. Requirements: All equipment shall be installed in accordance with manufacturer requirements and in compliance with all applicable local and national codes and requirements.

3.2 MANUFACTURES SERVICES

1. Factory Programming: All controllers shall be factory programmed upon request in accordance with the project specifications prior to shipment.
2. Installation Assistance: During the installation process, the manufacturer shall provide, at no cost, technical support via a toll-free telephone line to the installing contractor or owner's representative to answer questions and supply additional information when required.
3. System Start-Up: The system manufacturer shall provide a factory authorized field technician to the project site after installation has been completed and prior to the system being energized for the purpose of testing and adjustment of the system. Factory field technician shall test and verify all system functions and ensure proper operation of the system components in accordance with the specifications and on-site conditions. The installing contractor shall notify the system manufacturer in writing that the system is completely wired and ready to be energized and tested 4 weeks prior to scheduling a field technician for the start-up of the system. Should the field technician arrive on the job site and find the installation incomplete, the installing contractor shall pay the cost of any future visits by the field technician required to complete the system start-up.
4. On-Site Programming: During the start-up procedure, the factory field technician shall provide programming assistance and guidance to the building operating personnel in order to program the systems for initial operation.
5. Instruction: During the start-up procedure, the factory field technician shall provide training to the building operating personnel in the operation, programming, and maintenance of the lighting control system.
6. As-Built Drawings: After completion of the system installation and testing, the manufacturer shall provide 3 sets of "as-built" drawings.

7. Operation and Maintenance Manuals: After completion of the system installation and testing, the manufacturer shall provide 3 sets of Operations and Maintenance Manuals.
8. Lifetime Toll-Free Telephone Support: The system manufacturer shall provide a toll-free telephone number to the system user and shall allow access to free telephone support for the life of the 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. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and over-current protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.
 - 7. Include time-current coordination curves for each type and rating of over-current protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- B. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting over-current protective devices.
2. Time-current curves, including selectable ranges for each type of over-current protective device that allows adjustments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Circuit Breakers as called for in the panel schedule.
 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Dimensions: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 2000 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 1. Ambient temperatures within limits specified.
 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify Architect and Owner no fewer than ten (10) days in advance of proposed interruption of electric service.
 2. Do not proceed with interruption of electric service without Architect's and Owner's written permission.
 3. Comply with NFPA 70E.

1.10 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, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices 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 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and/or surface-mounted cabinets as shown on the plans.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

- e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
- 2. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pre-treating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
- 3. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- B. Incoming Mains Location: As required – coordinate prior to providing panelboard approval submittals.
- C. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Sub-feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Standard 4-piece trim.

- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices 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.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Hinged trim to box (door-in-door) flush latch with steel tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 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. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

- c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
- d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
- e. Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
- f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
- g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
- h. Multi-pole units enclosed in a single housing or factory assembled to operate as a single unit.
- i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in the position indicated on the plans.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407 and/or NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and/or NEMA PB 1.1.
- B. Mount such that the top-most switch or circuit breaker (in the panel) is not higher than 79 inches above finished floor or grade. Align adjacent panels for a neat appearance.
- C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- D. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Install filler plates in unused spaces.

- F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- H. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: For all breakers in distribution panels, label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection (only) test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Electrical System Studies".

3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

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. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Receptacles with integral surge-suppression units.
 - 4. Tamper-resistant receptacles.
 - 5. Weather-resistant receptacles.
 - 6. Snap switches and wall-box dimmers.
 - 7. Wall-switch and exterior occupancy sensors.
 - 8. Communications outlets.
 - 9. Pendant cord-connector devices.
 - 10. Cord and plug sets.
 - 11. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
 - 3. Coordinate all device colors in writing with Architect/Engineer prior to submittal process and provide approval with submittals for devices.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 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. Service/Power Poles: One for every 10, but no fewer than one.
 - 2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
 - 3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other 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/Legrand (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-596.
 - 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).
- B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; TR8300.
 - b. Hubbell; HBL8300SGA.
 - c. Leviton; 8300-SGG.
 - d. Pass & Seymour; TR63H.

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.
- C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A :
 - 1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
 - 2. Configuration: NEMA WD 6, Configuration 5-15R.
 - 3. Type: Non feed-through.
 - 4. Standards: Comply with UL 498 and UL 943 Class A.
 - 5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.
- D. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.

2.5 USB RECEPTACLES

A. USB Charging Receptacles :

1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
2. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
3. Standards: Comply with UL 1310 and USB 3.0 devices.

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; CWL520R.
 - b. Hubbell; HBL2310.
 - c. Leviton; 2310.
 - d. Pass & Seymour; L520-R.

2.7 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. 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.
- C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: 302 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 and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type activation or recess-type activation, as scheduled on the plans.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: As called for on the Plans.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Modular, keyed, color-coded, RJ-45 jacks (quantity as shown on plans) for UTP cable complying with requirements in Section 269000 "Structured Cabling System."

2.11 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.
 2. Wiring Devices Connected to Emergency Power System: Red.
- B. Wall Plate Color: For plastic covers, match device color as selected by Architect.

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 block 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 complete.
- C. Conductors:
 - 1. Do not 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.
 - 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device 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 its 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 moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) 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 metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes 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 floor service outlets and 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 IDENTIFICATION
- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.4 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 damaged 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 and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Non-fusible switches.
 - 3. Shunt trip switches.
 - 4. Molded-case circuit breakers (MCCBs).
 - 5. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Dimensions: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Provide mounting structure for safety switches independent of the equipment and install flexible connection from switch to equipment as required.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. 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; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NON-FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Bussmann, Inc.
 2. Ferraz Shawmut, Inc.
 3. Littelfuse, Inc.
- B. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.
- D. Accessories:
 1. Oiltight key switch for key-to-test function.
 2. Oiltight green ON pilot light.
 3. Isolated neutral lug; 100 percent rating.
 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
 5. Form C alarm contacts that change state when switch is tripped.
 6. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. 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.
- D. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

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

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection (only) test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Electrical System Studies"

END OF SECTION

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. A single natural gas fired, standby generator sets and automatic transfer switch shall be provided and installed by this contractor for the project. See plans (and elsewhere in these specifications) for required ratings.
- B. Construction of the required reinforced concrete generator equipment pad at all three (3) locations shall be by the electrical contractor.
- C. This Section includes packaged engine-generator sets for emergency power supply with the following features:
 - 1. Natural gas engine.
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Outdoor enclosure.
- D. Related Sections include the following:
 - 1. Section 26 36 00 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

- A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.
- B. No.2 diesel.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- 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 ASME B15.1.

- E. Comply with NFPA 37.
- F. Comply with NFPA 70.
- G. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
- H. Comply with UL 2200.
- I. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- J. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Electrical Service: 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:
 - 1. Notify Architect and Owner no fewer than ten (10) days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Architect's written permission.
- B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 - 1. Ambient Temperature: 10 degrees Fahrenheit to 95 degrees Fahrenheit
 - 2. Relative Humidity: 0 to 95 percent.
 - 3. Altitude: Sea level to 1000 feet.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. Caterpillar Power.
 - 2. Generac Power Systems, Inc.
 - 3. Kohler Co.; Generator Division.

2.2 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, engine-generator set.

- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
 - 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- C. Capacities and Characteristics:
 - 1. Power Output Ratings: Nominal ratings as indicated on the plans.
 - 2. Output Connections: Three-phase, four wire.
 - 3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- D. Generator-Set Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
 - 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 - 7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
 - 8. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.3 ENGINE

- A. Fuel: Natural gas.
- B. Rated Engine Speed: 1800 rpm.
- C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.
- D. Lubrication System: The following items are mounted on engine or skid:
 - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 - 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- E. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.
- F. Governor: Adjustable isochronous, with speed sensing.
- G. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 4. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- H. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 1. Minimum sound attenuation of 25 dB at 500 Hz.
 2. Sound level measured at a distance of 10 feet from exhaust discharge after installation is complete shall be 85 dBA or less.
- I. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- J. Starting System: 24-V electric, with negative ground.
 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least twice without recharging.
 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 6. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.

7. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.4 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.
- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
 1. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.
- D. Indicating and Protective Devices and Controls:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Generator overload.

- E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- F. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Section 260913 "Electrical Power Monitoring and Control."
- G. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.
 1. Overcrank shutdown.
 2. Coolant low-temperature alarm.
 3. Control switch not in auto position.
 4. Battery-charger malfunction alarm.
 5. Battery low-voltage alarm.
- H. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
- I. Generator set to be furnished and install with wireless communication/cellular monitoring equipment to communicate current generator status and alarms to owner (Omnimatrix or approved equal).
- J. Remote Emergency-Stop Switch: Wall mounted adjacent to generator set unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.5 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Circuit Breaker: Molded-case, thermal-magnetic type complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

2.6 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H or Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Enclosure: Dripproof.
- G. Instrument Transformers: Mounted within generator enclosure.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
 1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.
- I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Subtransient Reactance: 12 percent, maximum.

2.7 OUTDOOR SOUND ATTENUATED ENCLOSURE

- A. Description: Weatherproof steel housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
- B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
 1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.

2.8 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Standard neoprene.

2.9 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.10 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup.
7. Safety shutdown.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
9. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Install packaged engine generator with elastomeric isolator pads having a minimum deflection of 1 inch on 4-inch-high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is elsewhere in these specifications.

- D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- C. Connect engine exhaust pipe to engine with flexible connector.
- D. Connect fuel piping to engines with a gate valve and union and flexible connector.
 - 1. Natural-gas piping, valves, and specialties for gas distribution are specified in elsewhere in these specifications.
- E. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- F. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

- A. Identify system components according to Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Perform tests and inspections and prepare test reports.
 - 1. Perform required testing in conjunction with fire pump as required by Fire Marshal.
 - 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
 - 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 - 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
- D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
- G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- H. Remove and replace malfunctioning units and retest as specified above.
- I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

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. The transfer switch will be furnished and installed by this contractor. The required ratings and configurations for the transfer switch shall be as shown on the plans.
- B. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Caterpillar; Engine Div.
 - b. Generac Power Systems, Inc.
 - c. Kohler Power Systems; Generator Division.
 - d. ASCO.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Switch Rating – As shown on the plans.
- B. Switch Configurations – 3 pole with solid neutral.
- C. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.
- D. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- F. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.
- G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Switch Action: Double throw; mechanically held in both directions.

2. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.
- H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.
- I. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 26 05 53 "Identification for Electrical Systems."
 1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
- J. Enclosures: As indicated on plans, suitable for installed environment.

2.3 AUTOMATIC TRANSFER SWITCHES

- A. For standby system - Comply with Level 2 equipment according to NFPA 110.
- B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.
- C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- D. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.
- E. Automatic Transfer-Switch Features:
 1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
 2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
 3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
 4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
 5. Test Switch: Simulate normal-source failure.
 6. Switch-Position Pilot Lights: Indicate source to which load is connected.
 7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

- a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
- 8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
- 9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- 10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
- 11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
- 12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

- A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Annunciator and Control Panel Mounting: Surface mounted on wall, unless otherwise indicated.
- B. Identify components according to Section 26 05 53 "Electrical Identification."
- C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

- A. Ground equipment according to Section 26 05 26 "Grounding and Bonding."
- B. Connect wiring according to Section 26 05 19 "Low Voltage Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installation, including connections, and to assist in testing. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
 - a. Check for electrical continuity of circuits and for short circuits.
 - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
 - c. Verify that manual transfer warnings are properly placed.
 - d. Perform manual transfer operation.
4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Verify time-delay settings.
 - c. Verify pickup and dropout voltages by data readout or inspection of control settings.
 - d. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

26 43 13 - 1 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 describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.3 CODES AND STANDARDS

- A. ANSI/IEEE Std C62.41.1^a-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- B. ANSI/IEEE Std C62.41.2^a-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- C. ANSI/IEEE Std C62.45^a -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
- D. ANSI C8 4.1, American National Standard for Electric Power Systems and Equipment Voltage Ratings (60 Hertz)
- E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1
- F. National Fire Protection Association (NFPA) 70 (N.E.C.) © 2002 - Article 285

1.4 DEFINITIONS

- A. I nominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

1.5 QUALITY ASSURANCE

- A. All Surge Protective Devices (SPDs) shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) and Complimentary Listed to UL 1283 by 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. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). Manufactured in accordance with UL 1449 is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

- B. Pre-Approval submittals for products by manufacturers not listed above must be submitted not less than ten (10) business days prior to bid date to allow ample engineering time for review of submitted products. Products not submitted within this timeframe will not be reviewed.
- C. Submit proper documentation showing detailed (line-by-line) compliance with this specification. Prior approvals not received by the deadline date defined above will not be considered.
- D. Along with the line-by-line comparison from manufacturers not listed herein, pre-approval surge suppression submittals shall include all of the items listed in Section V, below.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
 - 3. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.
 - 4. Dimensioned drawing of each suppressor type indicating mounting arrangement.
 - 5. Manufacturers ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
 - 6. Manufacturers UL 1283 listing classification page and listing number(s).
 - 7. Certified test data documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270 degree electrical phase angles).
 - 8. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
 - 9. Certificate of declaration that product is CE low voltage directive compliant
 - 10. Statement of manufacturer's warranty duration and replacement policy.

1.7 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

- B. Sample Warranty: For manufacturer's special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For SPDs to include in maintenance manuals.

1.9 WARRANTY

- A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of twenty-five (25) years from date of substantial completion.
- B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.
- C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Surge Suppression Incorporated – Specified on plans.
 - 2. Emerson (Liebert) Incorporated, (560xx16 & 570xx17) Series only.
 - 3. Current Technology (SL3-150) Series only.
- B. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.
- C. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.
- D. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters), in combination with or for the protection of the suppression elements are expressly prohibited and will be rejected.
- E. The listing of a manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein.

2.2 GENERAL SPD REQUIREMENTS

- A. SPD with 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. Comply with UL 1449.
- D. The Surge Protective Devices (SPD's) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.
- E. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc)
- F. SPD's shall be Type 2 SPD's, Type 4 SPD's are not permitted.
- G. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.
- H. The SPD shall be self-restoring and fully automatic.
- I. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the short circuit current rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.
- J. Permanently connected devices mounted parallel to the service, distribution, and sub panels are required. SPD device drawings shall be made available upon request.
- K. The SPD shall have a Nominal Discharge Current (In) of 20 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006. 20kA is the most severe.)
- L. Fusing:
 - 1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV.
 - 2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated "silver-fuse-wire" (or other).
 - 3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is expressly prohibited and will be rejected.
 - 4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).
- M. MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.
- N. Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar"

short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

- O. Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable and are not to be submitted. For 6 mode delta systems, 6 dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G). When a mode of protection is specified, the protective mode must be specifically included. Thus, Line-to-Neutral-to-Line is not acceptable where Line-to-Line is specified.
- P. Sinewave Tracking Capability: Power panels and MCCs serving sensitive electronic equipment shall utilize voltage independent, dedicated Sinewave Tracking circuitry. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking! To demonstrate the sinewave tracking capability of the submitted devices, manufacturers shall submit 3rd party, independent tests results for units claiming sinewave tracking capability. Such tests shall include testing under the standards of ANSI/IEEE C62.41 and C62.45 category A1 (2kV, 67A, 100kHz ring wave) applied at the 270 degree phase angle, positive polarity, on a 120/208Vrms, 3 phase Wye device, on each of the following modes: line-to-neutral, line-to-ground, and line-to-line (dynamic tests with normal voltage applied to the unit under test), and neutral-to-ground (static test with no normal voltage applied to unit under test). The "let-through voltage" derived from each of these tests shall have a maximum amplitude of less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient. Measurement of the let-through voltage shall be made with six-inches of lead length external to the SPD housing in accordance with ANSI/UL 1449-2006. Performance requirements are as stated in the table in Section VIII below (ANSI/IEEE C62.41 Let-Through Voltage) at Test Category A1.
- Q. Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Refer to the appropriate drawings and schedules for these details.
- R. Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2001 certified company normally engaged in the design, development, and manufacture of such equipment.
- S. Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with "load carrying" components are

expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

- T. Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.
- U. Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.
- V. Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

2.3 PERFORMANCE REQUIREMENTS

- A. SPDs shall meet the following performance requirements:
 - 1. Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the section below.
 - 2. Building Distribution Panels (Category B): The SPD shall provide a minimum protection of 180 kA per phase and be capable of meeting the Category B3-High Let-Through Voltage criteria as shown in the section below.
 - 3. Branch Panels/Panelboards (Non-Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.
 - 4. Branch Panels/Panelboards (Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase, be of sinewave tracking design, and be capable of meeting the Category A Let-Through Voltage criteria as shown in the section below.

2.4 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

- A. The SPD shall meet the Let-Through Voltage requirements shown below for voltage and locations specified. All voltages shall be peak (+or -10%) Positive Polarity, Time base = 10uS, Sampling Rate = 500ms/s to ensure maximum transient capture. These settings assure Let-through Voltage test results are accurate. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (un-powered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:
 - 1. Service Entrance Panels - ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree

phase angle shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

- a. Line to Neutral: 1075 V for 208Y/120 V and 1340V for 480Y/277 V
 - b. Line to Line: 1990 V for 480Y/277 V and 1390 V for 208Y/120 V.
 - c. Line to Ground: 1310 V for 480Y/277 V and 1060 V for 208Y/120 V.
 - d. Neutral to Ground: 1730 V for 480Y/277 V and 1450 V for 208Y/120 V.
2. Distribution and Branch Panels (non-electronics) - ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):
- a. Line to Neutral: 520 V for 480Y/277 V and 395 V for 208Y/120 V.
 - b. Line to Line: 790 V for 480Y/277 V and 570 V for 208Y/120 V.
 - c. Line to Ground: 500 V for 480Y/277 V and 375 V for 208Y/120 V.
 - d. Neutral to Ground: 1010 V for 480Y/277 V and 590 V for 208Y/120 V.
3. Branch Panels Feeding Electronic Equipment - ANSI/IEEE Cat. A Ring Wave Let-through-Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Ring Wave (2kV, 67 amps, 100kHz ring wave) at the 270 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sinewave to the peak of the transient):
- a. Line to Neutral: 67 V for 480Y/277 V and 30 V for 208Y/120 V.
 - b. Line to Line: 65 V for 480Y/277 V and 60 V for 208Y/120 V.
 - c. Line to Ground: 85 V for 480Y/277 V and 50 V for 208Y/120 V.
 - d. Neutral to Ground: 65 V for 480Y/277 V and 50 V for 208Y/120 V.

2.5 ANSI/UL 1449-2006 VOLTAGE PROTECTIVE RATING

- A. Voltage Protection Rating (VPR) is a rating selected from a list of preferred values as detailed in ANSI/UL 1449-2006 and assigned to each mode of protection. The value of VPR is determined as the nearest highest value taken from a list of preferred values (as detailed in ANSI/UL 1449-2006) compared to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

1. Single Phase Units (120/240 Volt)
 - a. Line to Neutral: 600 V .
 - b. Line to Ground: 600 V.
 - c. Neutral to Ground: 700 V.
 - d. Line to Line: 1000 V.

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2. Three Phase Units (120/208 Volt)

- a. Line to Neutral: 600 V .
- b. Line to Ground: 600 V.
- c. Neutral to Ground: 700 V.
- d. Line to Line: 1000 V.

2.6 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R or Type 4X.

2.7 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low Voltage Electrical Power Conductors and Cables."
- B. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Wiring:
 - 1. Power Wiring: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."
 - 2. Controls: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."
- F. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.

- G. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.
- H. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.
- I. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.
- J. If any lead lengths exceed 18", the Contractor responsible for installation must contact the specifying electrical engineer and the surge suppression manufacturer or distributor (888-212-2728) for installation assistance.
- K. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.
- L. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.
- M. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.
- N. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.

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- C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Complete startup checks according to manufacturer's written instructions.
- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. Related Sections:
 - 1. Section 26 07 26 "Wiring Devices" for manual wall-box dimmers LED fixtures/drivers.
 - 2. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. HID: High-intensity discharge.
- D. LER: Luminaire efficacy rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast, including BF.
 - 4. Energy-efficiency data.
 - 5. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified elsewhere in these specifications - "Diffusers, Registers, and Grilles."
 - 6. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.

7. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

- a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

- B. Shop Drawings: For nonstandard or custom lighting fixtures. 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.

- C. Installation instructions.

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. Lighting fixtures.

2. Suspended ceiling components.

3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.

4. Ceiling-mounted projectors.

5. Structural members to which suspension systems for lighting fixtures will be attached.

6. Other items in finished ceiling including the following:

- a. Air outlets and inlets.

- b. Speakers.

- c. Sprinklers.

- d. Smoke and fire detectors.

- e. Occupancy sensors.

- f. Photo-sensors.

- g. Access panels.

- h. Ceiling projector mounts.

- i. Ceiling mounted surveillance cameras.

7. Perimeter moldings.

- B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, 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. Fixtures: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. LED drivers: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. 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.
- C. Comply with NFPA 70.
- D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
 - 1. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. On-site coordination meetings: Provide three on-site coordination meetings between contractor and authorized lighting manufacturer's representative to review the following:
 - 1. Pre-construction meeting, prior to rough in stage to review control wiring diagrams, control component placement, occupancy sensor location/placement, wiring types and interconnections, locations of racks/panels, and general overview of control system.
 - 2. Mock up review, after completion of mock-up areas to review operation of each area type for correct operation. At this meeting, the general settings, adjustments, and programming shall be documented and implemented.
 - 3. Final operational test shall take place at substantial completion to verify proper operation of entire building and site lighting control systems. Final settings and programming adjustments shall be made to the satisfaction of the engineer and

architect and fully documented for future reference by the owner as required, and included/provided in the final closeout documentation.

1.9 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Sheet Metal Components:
 - 1. Formed from 22 gauge steel unless otherwise indicated.
 - 2. Form and support to prevent warping and sagging.
 - 3. Free of burrs and sharp corners and edges.
 - 4. Cleaned and powder-coated after fabrication
- C. LED fixtures: Comply with UL 1598. L80 Performance for 50,000 hours. Color temperature consistency shall be indistinguishable and the color shift over a five year period shall be less than 0.007 on the CIE 1976 (u',v') diagram, or a 7-step MacAdam ellipse.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Doors, Frames, and Other Internal Access:
 - 1. Spring loaded cam type latches.
 - 2. Gasketed lens frame – fixture to be free of light leakage under operating conditions.
 - 3. Designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
- F. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: 0.125 inch MINIMUM unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located 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 and ballast characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. CCT and CRI for all luminaires.

2.3 LED DRIVERS

- A. Ambient temperature ratings shall be -40 deg F minimum, 130 deg F maximum
- B. Power factor: 0.94 or higher
- C. Total Harmonic distortion: <20%
- D. Minimum warranty on drivers 5 years
- E. NRTL certified (UL/CSA/FM)

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
 2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
 1. Battery: Sealed, maintenance-free, lead-acid type.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and non-metallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gauge.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures:
 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports:

1. Install ceiling support system wires, independent of the ceiling suspension devices and grid, to all four corners of each fixture.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

E. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

G. Connect wiring according to Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Electrical Identification."

3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

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 LED luminaires.
 - 2. Luminaire-mounted photoelectric relays.
 - 3. Poles and accessories.
- B. Related Sections:
 - 1. Section 26 51 00 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

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. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaire.
 - 4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - 5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79.
 - a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP 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.
 - 6. Wiring diagrams for power, control, and signal wiring.

7. Photoelectric relays.
 8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.
- 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. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For luminaire supports.
1. Include design calculations for luminaire supports.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: 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. Luminaires.
 2. Structural members to which equipment and luminaires will be attached.
 3. Underground utilities and structures.
 4. Existing underground utilities and structures.
 5. Above-grade utilities and structures.
 6. Existing above-grade utilities and structures.
 7. Building features.
 8. Vertical and horizontal information.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires and their installation requirements.
- C. Product Certificates: For each type of the following:
1. Luminaire.
 2. Photoelectric relay.
- D. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.
- E. Source quality-control reports.
- F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use 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: One for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 4. 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: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program 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.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with IEEE C2, "National Electrical Safety Code."
- E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.
- D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.
- E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
 - 4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. 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. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.
- N. Factory-Applied Finish for Aluminum luminaires: 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.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
 - 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - a. Color: As selected by Architect from manufacturer's standard catalog of colors.
- O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located 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 and ballast characteristics:

- a. "USES ONLY" and include specific lamp type.
- b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
- c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
- d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
- e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- f. CCT and CRI for all luminaires.

2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
 - 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
 - 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.2 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
 - 3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.
- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."
- F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.
- G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.4 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.
 - 1. Shape: Square, straight.
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Steel Mast Arms: Type as shown/called for on the plans, continuously welded to pole attachment plate. Material and finish same as pole.
- C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 - 1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with stainless-steel bolts.
 - 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 - 3. Match pole material and finish.
- D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.
- F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.
- G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- I. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.
- J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- K. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove

mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's standard catalog of colors.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
 3. Trees: 15 feet from tree trunk.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 3. Install base covers unless otherwise indicated.
 4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

- E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
 - 1. Dig holes large enough to permit use of tampers in the full depth of hole.
 - 2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
 - 1. Make holes 6 inches in diameter larger than pole diameter.
 - 2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
 - 3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
 - 4. Cure concrete a minimum of 72 hours before performing work on pole.
- G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
- H. Raise and set poles using web fabric slings (not chain or cable).

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified elsewhere in these specifications.

3.4 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 GROUNDING

- A. Ground metal poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground non-metallic poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole.

2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.6 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 1. Verify operation of photoelectric controls.
- C. Illumination Tests:
 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
 - a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
 - b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
 - c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
 - d. IESNA LM-64, "Photometric Measurements of Parking Areas."
 - e. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. **Contractor Qualifications/Certifications: The fire detection and alarm system controls contractor shall hold a permit from the Alabama State Fire Marshal. The fire alarm system contractor shall provide a copy of the State Fire Marshal's permit to the owner and engineer so that the Engineer may review the contractor's qualifications prior to any work taking place. SEE SPECIFICATIONS SECTION 28 31 11, APPENDIX FOR COPY OF STATE REQUIREMENTS FOR FIRE ALARM CONTRACTOR.**
- B. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, new voice evacuation module, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- C. The fire alarm system shall comply with requirements of IFC 2015 and NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- D. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.2 SCOPE:

- A. Relocate existing intelligent reporting, microprocessor controlled fire detection system as shown for the renovated buildings in accordance to the project specifications and drawings. Furnish and install a new, compatible, voice evacuation module.
- B. Furnish and install new appliances (initiation and notification) and connect to ~~existing~~ fire alarm control panel as required.

1.3 ASIC PERFORMANCE:

- A. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
- B. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
- C. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
- D. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

- E. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
- F. Where required, two-way telephone communication circuits shall be supervised for open and short circuit conditions.

1.4 BASIC SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected and reported by the system initiating devices, the following functions shall immediately occur:
 - 1. The system alarm LED on the system display shall flash.
 - 2. A local piezo electric signal in the control panel shall sound.
 - 3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - 4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
 - 5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.5 SUBMITTALS

- A. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
- B. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
- C. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
 - 3. Show annunciator layout, configurations, and terminations.
 - 4. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
 - 5. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
 - 6. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.6 SOFTWARE MODIFICATIONS

- A. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
- B. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system

structure and software shall place no limit on the type or extent of software modifications on-site.

1.7 CERTIFICATIONS

- A. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.8 GUARANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal.

1.9 POST CONTRACT MAINTENANCE

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
- D. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
- E. Each circuit in the fire alarm system shall be tested semiannually.
- F. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.10 POST CONTRACT EXPANSIONS

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.
- D. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

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1.11 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
 - 1. International Building Code 2015
 - 2. International Fire Code 2015
 - 3. National Fire Protection Association (NFPA) - USA:
 - a. No. 13 Sprinkler Systems
 - b. No. 15 Water Spray Systems
 - c. No. 17 Dry Chemical Extinguishing Systems
 - d. No. 72 National Fire Alarm Code
 - e. No. 101 Life Safety Code
 - f. Underwriters Laboratories Inc. (UL) - USA:
 - g. No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - h. No. 864 Control Units for Fire Protective Signaling Systems
 - i. No. 268A Smoke Detectors for Duct Applications
 - j. No. 521 Heat Detectors for Fire Protective Signaling Systems
 - k. No. 464 Audible Signaling Appliances
 - l. No. 38 Manually Actuated Signaling Boxes
 - m. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
 - n. No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
 - o. No. 1971 Visual Notification Appliances
 - 4. Local and State Building Codes.
 - 5. All requirements of the Authority Having Jurisdiction (AHJ).

1.12 APPROVALS

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
 - 1. UL Underwriters Laboratories Inc
- B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Edwards United Technologies
- B. Gamewell-FCI Fire Alarm Systems
- C. Notifier Fire Alarm Systems
- D. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than that specified proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment shall be provided. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall

also specifically certify that the system is capable of complying with the test requirements of this section.

2.2 CONTROL PANEL HARDWARE

- A. Existing to be relocated
- B. Batteries:
 1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.

2.3 SYSTEM PERIPHERALS

- A. Addressable Devices - General:
 1. Provide address-setting means using rotary-decimal switches.
 2. Use simple to install and maintain decade-type (numbered 0 to 9) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
 3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
 4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
 5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
 6. Using software in INCC Command Center, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
 7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
 8. Following bases and auxiliary functions shall be available:
 - a. Standard base with remote LED output.
 - b. Sounder base rated at 85 dBA minimum.
 - c. Form-C relay base rated 30 VDC, 2.0 A.
 - d. Isolator base.
 9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
 10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).
- B. Addressable Manual Stations:
 1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.

2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
 3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
 4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
 5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.
- C. Intelligent Thermal Detectors: Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.
- D. Intelligent Photoelectric Smoke Detectors with CO sensor: Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.
- E. Intelligent Ionization Smoke Detectors with CO sensor: Use dual-chamber ionization principal to measure products of combustion and shall, on command from control panel, send data to panel representing analog level of products of combustion.
- F. Intelligent Duct Smoke Detectors:
1. In-Duct Smoke Detector Housing: Use on-board intelligent photoelectric detector, which provides continuous analog monitoring and alarm verification from panel.
 2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.
 3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide with remote alarm indicator.
 4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
- G. Addressable Dry Contact Monitor Modules:
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in standard deep electrical box.
 3. IDC Zone: Suitable for Style B operation.
- H. Addressable Dry Contact Monitor Modules:
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
 3. IDC Zone: Suitable for Style D or Style B operation.
 4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.
- I. Addressable Dry Contact Monitor Modules:
1. Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.

3. IDC Zones: Suitable for Style B operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

J. Addressable Control Modules:

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

K. Addressable Relay Modules:

1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

L. Isolator Modules:

1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.
2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
4. Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.
5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

M. Notification appliances

1. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
2. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
3. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating

mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured **10 feet** from the horn, using the coded signal prescribed in UL 464 test protocol.

4. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum **1-inch**- high letters on the lens.
 - a. Rated Light Output:
 - 1) 15/30/75/110 cd, selectable in the field.
 - b. Mounting: Wall mounted unless otherwise indicated.
 - c. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - d. Flashing shall be in a temporal pattern, synchronized with other units.
 - e. Strobe Leads: Factory connected to screw terminals.
 - f. Mounting Faceplate: Factory finished, red.
5. Voice/Tone Notification Appliances:
 - a. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 - b. High-Range Units: Rated 2 to 15 W.
 - c. Low-Range Units: Rated 1 to 2 W.
 - d. Mounting: semirecessed.
 - e. Matching Transformers: Tap range matched to acoustical environment of speaker location.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer. ***Fire alarm system cabling, where routed above accessible ceilings, may be supported with j-hooks but must be supported separately from other low-voltage cabling.***
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST

- A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- D. Verify activation of all waterflow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open and short signaling line circuits and verify that the trouble signal actuates.

- G. Open and short notification appliance circuits and verify that trouble signal actuates.
- H. Ground all circuits and verify response of trouble signals.
- I. Check presence and audibility of tone at all alarm notification devices.
- J. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- K. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- L. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL OBSERVATION

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.
- B. Provide NFPA Form 72C Completion Form for the new fire alarm system installation.

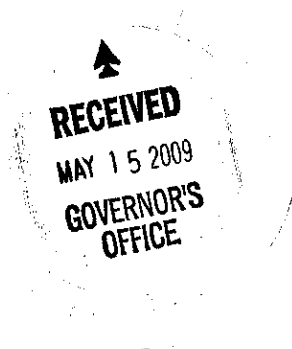
3.4 SYSTEM INSTRUCTION

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

ACT# 2009- 657

1 HB289
2 111990-4
3 By Representatives Hurst and Sanderford
4 RFD: Boards and Commissions
5 First Read: 03-FEB-09



1
2 ENROLLED, An Act,

3 Relating to fire alarm systems, to create a new
4 chapter in Title 34 of the Code of Alabama 1975, to regulate
5 and license persons who install a fire detection, fire alarm,
6 or fire communication system; to provide for administration by
7 the State Fire Marshal; to provide exceptions; to provide for
8 fees; to provide for criminal and civil penalties; and in
9 connection therewith would have as its purpose or effect the
10 requirement of a new or increased expenditure of local funds
11 within the meaning of Amendment 621 of the Constitution of
12 Alabama of 1901, now appearing as Section 111.05 of the
13 Official Recompilation of the Constitution of Alabama of 1901,
14 as amended.

15 BE IT ENACTED BY THE LEGISLATURE OF ALABAMA:

16 Section 1. Chapter 33A is added to Title 34 of the
17 Code of Alabama 1975, to read as follows:

18 §34-33A-1.

19 For purposes of this chapter, the following words
20 have the following meanings:

21 (1) CERTIFICATE HOLDER. An individual who is listed
22 on the State Fire Marshal's permit as the responsible managing
23 owner, partner, officer, or employee who is actively in charge
24 of the work of the certified fire alarm contractor meeting the
25 requirements established in Section 34-33A-4.

1 (2) CERTIFIED FIRE ALARM CONTRACTOR. A fire alarm
2 contractor who has qualified and received a permit from the
3 State Fire Marshal, with an NICET Level III on staff.

4 (3) FIRE ALARM CONTRACTOR. An individual,
5 partnership, corporation, association, or joint venture
6 engaged in the business of installation, repair, alteration,
7 addition, maintenance, or inspection of fire alarm systems.
8 The term does not include local building officials, fire
9 inspectors, or insurance inspectors when acting in their
10 official capacity.

11 (4) FIRE ALARM SYSTEM. A system or portion of a
12 combination system that consists of components and circuits
13 arranged to monitor and annunciate the status of fire alarm or
14 supervisory signal-initiating devices and to initiate the
15 appropriate response to those signals. ~~The~~ Any system
16 installed after the passage of this chapter shall follow the
17 installation standard set forth by the latest edition of the
18 National Fire Protection Association 72 National Fire Alarm
19 Code. The system shall meet the requirements of all locally
20 adopted codes and standards of the local municipality into
21 which the system is installed and shall be acceptable to the
22 local authority having jurisdiction.

23 (5) LICENSED ELECTRICAL CONTRACTOR. An individual,
24 partnership, corporation, association, or joint venture which
25 is licensed as an electrical contractor engaged in the

1 business of installation of conduit, wire, and fire alarm
2 associated equipment, but does not design, program, certify,
3 inspect, or test fire alarm systems. A licensed electrical
4 contractor is not a fire alarm contractor for the purpose of
5 this chapter.

6 (6) NICET. National Institute for Certification in
7 Engineering Technology.

8 (7) STATE FIRE MARSHAL'S PERMIT. The form issued by
9 the State Fire Marshal to a fire alarm contractor upon
10 application being approved and fee paid. The permit shall be
11 issued in the name of the fire alarm contractor, with the name
12 of the certificate holder noted thereon.

13 §34-33A-2.

14 The administration of this chapter is vested in the
15 State Fire Marshal who shall have the power to set or make
16 changes in the amount of the fee charged as necessary for the
17 administration and enforcement of this chapter.

18 §34-33A-3.

19 (a) It shall be unlawful for any individual,
20 partnership, corporation, association, or joint venture to
21 engage in the business of installation, repair, alteration,
22 addition, maintenance, or inspection of a fire alarm system in
23 this state except in conformity with this chapter.

24 (b) This chapter shall not apply to the following:

1 (1) The owner of a fire alarm system who employs
2 ~~registered professional fire protection engineers and skilled~~
3 trained workers who regularly and routinely ~~design,~~ install,
4 repair, alter, add to, maintain, and inspect fire alarm
5 systems on and within the premises of the owner for the use of
6 the owner only.

7 ~~(2) A smoke detector installed in one or two family~~
8 ~~dwelling by a licensed electrical contractor.~~

9 (2) A smoke detector installed in a residential
10 dwelling.

11 (3) A residential combination burglary and fire
12 alarm system installed by a licensed burglary alarm contractor
13 in a residential occupancy as defined in the adopted building
14 code where located.

15 §34-33A-4.

16 (a) Every fire alarm system installed in this state
17 shall have a record of completion signed by a certified fire
18 alarm contractor, in accordance with the requirements of the
19 adopted building code and fire alarm code. The record of
20 completion and all supporting documents shall be available for
21 inspection by the State Fire Marshal or his or her designated
22 representative during normal business hours.

23 (b) Every fire alarm system in this state shall have
24 the name, address, phone number, and permit number, of the
25 responsible certified fire alarm contractor attached to the

1 main fire alarm control in a manner as prescribed by and
2 acceptable to the State Fire Marshal.

3 (c) Every fire alarm system in this state installed
4 after the passage of this chapter shall be maintained and
5 inspected by a certified fire alarm contractor in accordance
6 with the requirements of the most recently adopted version of
7 the National Fire Protection Association 72 National Fire
8 Alarm Code. Testing documentation shall be maintained by the
9 owner for inspection by the State Fire Marshal or his or her
10 designated representative during normal business hours.

11 §34-33A-5.

12 (a) Any individual, partnership, corporation,
13 association, or joint venture desiring to engage in the
14 business as a fire alarm contractor shall submit to the State
15 Fire Marshal on standard forms provided by the State Fire
16 Marshal a completed application. The applicant shall include a
17 fee of one hundred dollars (\$100) when making the application.
18 The applicant shall designate in the application the name of
19 the proposed certificate holder and provide written proof that
20 the individual has met all of the requirements and passed a
21 competency test administered by NICET as a Fire Alarm System
22 Technician - Level III or above. A copy of the current NICET
23 certificate shall be accepted as sufficient written proof as
24 required above. The State Fire Marshal, upon receipt of the
25 application and fee, shall issue a State Fire Marshal's permit

1 to a fire alarm contractor who has a current State Fire
2 Marshal's Permit, or who produces evidence of having a current
3 state permit from another state, if the state has entered into
4 an agreement of reciprocity with the State of Alabama.

5 (b) (1) Any individual desiring to engage in the
6 programming, maintenance, testing, inspection, certification,
7 or modification of fire alarm systems shall provide current
8 written proof that he or she has passed a competency test
9 administered by the NICET as a Fire Alarm System Technician -
10 Level II or any other acceptable nationally recognized fire
11 alarm technician certification requiring continuing education
12 that is deemed equivalent by the State Fire Marshal.

13 (2) Each individual, partnership, corporation,
14 association, or joint venture shall have 36 months after the
15 effective date of this chapter to be in full compliance with
16 the requirement of this subsection.

17 (3) A new employee who is hired by a certified fire
18 alarm contractor shall have 12 months from the date of hiring
19 to comply with the requirements of this chapter. A new
20 employee who is not in compliance with this chapter shall work
21 under the direct supervision of the certificate holder of the
22 certified fire alarm contractor.

23 §34-33A-6.

24 If the required fee has been paid, satisfactory
25 written proof from the NICET has been provided that the

1 requirements have been met and a competency test was passed
2 when required by this chapter, and the proposed certificate
3 holder is found to be a responsible, managing owner, partner,
4 officer, or employee of the fire alarm contractor, the State
5 Fire Marshal within 30 days shall issue a State Fire Marshal's
6 permit in the name of the fire alarm contractor with the name
7 of the certificate holder noted thereon.

8 §34-33A-7.

9 A certificate holder may not obtain a State Fire
10 Marshal's permit for more than one fire alarm contractor at
11 any time. A certificate holder may only hold a certificate for
12 the fire alarm contractor where he or she is currently
13 employed. If the certificate holder leaves the employment of
14 the fire alarm contractor, the certificate holder shall notify
15 the State Fire Marshal within 30 days. The certificate holder
16 may not obtain a State Fire Marshal's permit for more than one
17 other fire alarm contractor for a period of 12 months
18 thereafter. If the certificate holder leaves the employment of
19 the fire alarm contractor, or dies, the fire alarm contractor
20 shall have nine months to submit a new application proposing
21 designation of another individual as the certificate holder
22 for the applicant. If the application is not received and a
23 new permit issued within the allotted time, the State Fire
24 Marshal shall revoke the permit of the fire alarm contractor.

25 §34-33A-8.

1 A State Fire Marshal's permit shall expire annually
2 at midnight on September 30. At least 30 days prior to
3 expiration, a renewal application with a renewal fee shall be
4 submitted. A permit which is not renewed prior to expiration
5 shall be null and void on the expiration date, and it shall be
6 unlawful under this chapter for any individual, partnership,
7 corporation, association, or joint venture to engage in the
8 business of installing, repairing, altering, adding,
9 maintaining, or inspecting a fire alarm system without a
10 validly renewed State Fire Marshal's permit. The permit may be
11 reinstated by making application as before and payment of the
12 fee; however, until the time as a new permit is issued, it
13 shall be unlawful for the fire alarm contractor to engage in
14 installing, repairing, altering, adding, maintaining, or
15 inspecting fire alarm systems.

16 §34-33A-9.

17 If a certified fire alarm contractor desires to do
18 business in any part of the state, he or she shall deliver to
19 the local building official a copy of his or her State Fire
20 Marshal's permit. The local building official shall require a
21 copy of the State Fire Marshal's permit before issuing a
22 license or building permit. The certified fire alarm
23 contractor shall pay any fees normally imposed for local
24 licenses or permits. The local official may not impose other
25 requirements on the certified fire alarm contractor to prove

1 competency other than proper evidence of a valid State Fire
2 Marshal's permit.

3 §34-33A-10.

4 Nothing in this chapter limits the power of a
5 municipality, county, or the state to regulate the quality and
6 character of work performed by contractors, through a system
7 of permits, fees, and inspections which are designed to assure
8 compliance with, and aid in the implementation of, state and
9 local building laws or to enforce other local laws for the
10 protection of the public health and safety. Nothing in this
11 chapter limits the power of a municipality, county, or the
12 state to adopt any system of permits requiring submission to
13 and approval by the municipality, county, or the state, of
14 plans and specifications for work to be performed by
15 contractors before commencement of the work..If the plans for
16 a fire alarm system are required to be submitted to and
17 approved by any municipality, county, or the state, or any
18 departments or agencies thereof, the plans shall bear the seal
19 of a professional engineer licensed in the State of Alabama or
20 be submitted by a certified fire alarm contractor. The
21 official authorized to issue building or other related permits
22 shall ascertain that the fire alarm contractor is duly
23 certified by requiring evidence of a valid State Fire
24 Marshal's permit.

25 §34-33A-11.

1 (a) This chapter applies to any fire alarm
2 contractor performing work for any municipality, county, or
3 the state. Officials of any municipality, county, or the state
4 shall determine compliance with this chapter before awarding
5 any contract for the installation, repair, alteration,
6 addition, or inspection of a fire alarm system. Any bid for a
7 contract shall be accompanied by a copy of a valid State Fire
8 Marshal's permit.

9 (b) All architects and engineers preparing plans and
10 specifications for work involving fire alarm systems to be
11 contracted in the State of Alabama shall include in their
12 invitation to bidders and their specifications a copy of this
13 chapter or portions as are deemed necessary to convey to the
14 invited bidder that it will be necessary for the bidder to
15 show evidence of licensure before a bid is considered whether
16 the bidder is a resident or nonresident of this state and
17 whether a license has been issued to the bidder or not.

18 §34-33A-12.

19 All funds collected pursuant to this chapter shall
20 be deposited in the State Treasury to the credit of the State
21 Fire Marshal's Fund authorized in Section 24-5-10. The State
22 Fire Marshal may expend moneys from the State Fire Marshal's
23 Fund for the administration and enforcement of this chapter.
24 The State Fire Marshal may receive grants and donations from
25 associations, firms, or individuals who are interested in the

1 upgrading and quality of fire alarm systems in compliance with
2 Alabama state ethics laws.

3 §34-33A-13.

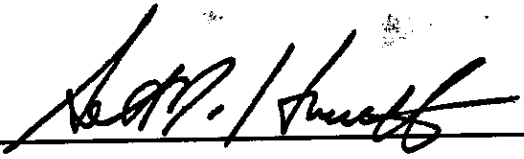
4 Whenever the State Fire Marshal has reason to
5 believe that any individual, partnership, corporation,
6 association, or joint venture is or has been violating any
7 provision of this chapter, the State Fire Marshal or his or
8 her deputy or assistant may issue and deliver to the
9 individual, partnership, corporation, association, or joint
10 venture an order to cease and desist the violation. Failure to
11 comply with any order under this section shall constitute a
12 Class B misdemeanor and shall be punishable as provided by
13 state law. In addition, the State Fire Marshal may impose a
14 civil penalty not to exceed two hundred fifty dollars (\$250)
15 for each day the violation exists. Violation of any provision
16 of this chapter or failure to comply with a cease and desist
17 order shall be cause for revocation of a State Fire Marshal's
18 permit.

19 Section 2. Although this bill would have as its
20 purpose or effect the requirement of a new or increased
21 expenditure of local funds, the bill is excluded from further
22 requirements and application under Amendment '621, now
23 appearing as Section 111.05 of the Official ReCompilation of
24 the Constitution of Alabama of 1901, as amended, because the

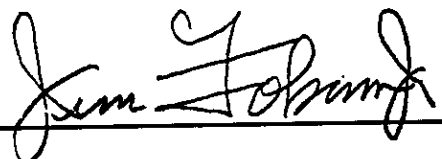
1 bill defines a new crime or amends the definition of an
2 existing crime.

3 Section 3. This act shall become effective on the
4 first day of the third month following its passage and
5 approval by the Governor, or its otherwise becoming law.

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Speaker of the House of Representatives



President and Presiding Officer of the Senate

House of Representatives

I hereby certify that the within Act originated in
and was passed by the House 06-MAY-09, as amended.

Greg Pappas
Clerk

Senate

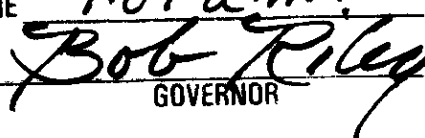
15-MAY-09

Amended and Passed

House

15-MAY-09

Concurred in Sen-
ate Amendment

APPROVED May 21, 2009
TIME 9:07 a.m.

GOVERNOR

Alabama Secretary Of State
Act Num....: 2009-657
Bill Num...: H-289
Recv'd 05/21/09 02:51pmJJB

SECTION 26 80 00

ACCESS CONTROL SYSTEM

PART 1 GENERAL

1.1 TERMS & CONDITIONS

- A. The system includes all items and subsystems shown on drawings or otherwise required by these specifications.

1.2 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 101 - Life Safety Code.
- C. UL 294 - Access Control Systems.
- D. UL 1076 - Proprietary Burglar Alarm Units and Systems.
- E. American with Disabilities Act - Public Law 101.336
- F. FCC
- G. CE
- H. NIST Triple DES Certificate #206

1.3 SCOPE OF WORK

- A. The SECURITY CONTRACTOR shall include all necessary wiring, cabling, labor, tools, equipment, and ancillary materials required to furnish and install a complete and operational system.
- B. Requirements are indicated elsewhere in these specifications for work including, but not limited to:
 - 1. Conduit, [110/230] VAC power and other electrical work shall be furnished and installed by electrical contractor.
 - a. Any/ all required electrical work above 70V shall be furnished and installed under this contract by a licensed electrical contractor.
 - 2. Electric door hardware, sensors, egress devices, and associated lock power supplies for card reader doors shall be specified by architect.
 - 3. The Contractor shall arrange for dedicated telephone lines and/or local area network (LAN) connections as shown on the attached drawings.
- C. The access control/ intrusion detection (AC/IDS) shall provide management, control, and monitoring of card access and alarms via the existing head-end equipment at Huntsville City Schools Board of Education Security operations facility.

- D. The extent of AC/IDS work is defined to include but not limited to the following:
1. Furnish, install and connect card readers not integrated with door hardware to access control system. All card readers shown on drawings and not included in the door hardware specification shall be furnished and installed by security contractor. Coordinate with door hardware supplier and approved door hardware submittals for equipment furnished by door hardware supplier.
 2. Connect integral card readers (furnished and installed with door hardware) to access control system.
 3. Furnish, install and connect door position sensors as required.
 4. Furnish and install access control panels and input modules as shown and connect to LAN as required.
 5. Integrate all new peripherals with owner's existing access control head-end equipment and campus control system as required. Integration shall be coordinated with OWNER'S Security operations personnel.
- E. Installing the AC/IDS and bringing it to operational status for acceptance shall include but not limited to the following:
1. Determine hardware, software, and operations requirements for implementation.
 2. Install AC/IDS hardware and software.
 3. Setup and configure communications between the host server, operator workstations, and control panels.
 4. Test AC/IDS operations based on a point-by-point walkthrough inspection.
 5. Perform end-user training.
- F. Special instructions
1. Contractor shall coordinate exact location, height and cable/ raceway routing for all new equipment with owner, architect and owner's security department prior to roughing.
 2. All card readers and door contacts shall be flush mounted and shall be suitable for the environment in which they are installed.
 3. All raceways and cabling shall be concealed in walls or above ceiling. Where finishes are disturbed, contractor shall repair/ replace surfaces to match original at no additional expense to owner.
 4. Any/ all exposed raceway/ conduit (where allowed in ceiling areas with exposed structure) shall be painted to match adjacent surface.
 5. Any/ all ceiling tiles damaged/ soiled during installation shall be replaced at no additional cost to owner.
 6. This security contractor shall be responsible for the coordination and arrangement of all power required for any equipment included in this contract. All work performed for circuits/ equipment requiring greater than 70V shall be done by the electrical contractor.
 7. Mullion-mounted card readers may be acceptable in specific locations if approved by owner.
 8. Security contractor shall provide redundant power supplies on all servers.
 9. Contractor shall coordinate with electrical contractor for provision of all 120v power at all locations where required. Contractor shall furnish and install all control power transformers for equipment as required.
 10. Contractor shall furnish and install all brackets, hardware and environmentally appropriate enclosures as required for all equipment. Contractor shall furnish and install wire guards for all equipment mounted in gymnasium.
 11. Contractor shall review and maintain all fire ratings.
 12. Coordinate conduit stub/ termination with architect where ceilings do not exist.
 13. Each door contact associated with a door/ leaf will require a dedicated input on the access control system.
 14. Access control system shall monitor utility power and report any/ all interruptions/ outages of utility power to owner's security department central command center.

15. Each location identified on drawings (access control panel) shall be equipped with an intelligent controller/ access control panel.
 16. In all locations where mag-locks are used, connect door controller/ power supply directly to fire alarm control panel to allow free egress at door during a fire alarm public notification event.
 17. All cables/ connections to the existing LAN shall be furnished, installed and completed by a qualified contractor per division 26 90 00 specifications.
- G. All access control devices, cabling, licenses, Interface boards, Controllers, connections, programming and integration to be included in the base bid.
- H. Reader interface boards and controllers to be installed in nearest Comm room

1.4 SUBMITTALS

- A. Submittals shall ensure that all parties involved can determine that the proposals meet the AC/IDS requirements as specified.
1. Executive Summary System Description: Descriptive statement and single-line block diagram to show how all related equipment will interface and operate as a complete AC/IDS.
 2. Product Data: Manufacturer's technical data sheets on each product to be used.
 3. Shop Drawings: Provide complete shop drawings that include the following:
 - a. Point-to-Point diagram of all system device locations on architectural floor plans; no other system(s) shall be included on these plans.
 - b. Detailed schematic wiring diagrams for all system devices. Wiring information shall include cable type, conductor routings, quantities, and connection details at devices.
 4. Manuals: Manufacturer's user's manuals for operations, administration, installation, and maintenance.
 5. Web-based Training: Access to web based training modules.
- B. Contract Close-Out Submittals:
1. Training Course Materials: Specified elsewhere in this document.
 2. Commissioning Test Plan and Check-Off List: Specified elsewhere in this document.
 3. As-Built Drawings: During system installation, the SECURITY CONTRACTOR shall maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the AC/IDS to be used for record drawings. This set shall be kept up to date, reflecting all changes and additions made to the AC/IDS. Copies of the final as-built drawings shall be provided to the owner in SEARCHABLE DXF format using the latest version of AutoCAD.
- C. Substitutions: Any proposed substitution must be submitted a minimum of 10 days prior to the bid. Any proposed substitution must be fully demonstrated to owner's security department prior to the bid and must FULLY integrate with the existing campus-wide Avigilon access control system at the same level as the specified system. Any system or component that has not been demonstrated to the full satisfaction of the owner's security department or has not been deemed acceptable by the owner's security department prior to the bid will not be accepted. The Owner and architect/ engineer reserves the right to reject and deny any substitution that it may, in its sole discretion, deem unequal, and the findings in this regard shall be accepted by the bidder as final and binding

1.5 WARRANTY AND MAINTENANCE

- A. The AC/IDS software, hardware, and installation shall be warranted against defects and workmanship for a minimum of (12) months, covering all parts and labor, after acceptance by OWNER.
- B. The SECURITY CONTRACTOR shall guarantee that the AC/IDS application software/firmware remains current at all times with the latest enhancements, and is supported by the AC/IDS manufacturer with unlimited remote dial-in diagnostics capability and technical phone support.
- C. The SECURITY CONTRACTOR shall perform manufacturer's recommended preventative maintenance on all applicable components and/or devices during the warranty period.
- D. The SECURITY CONTRACTOR shall be the primary contact and respondent for all service and support and officially recognized and backed by the AC/IDS manufacturer.
- E. Extended and/or out of warranty terms at reasonable and customary rates shall be available from the SECURITY CONTRACTOR.
- F. Include in contract sum, extended warranty and maintenance service after acceptance by Owner.
 - 1. Initial Warranty and Maintenance Service Extended to one year.
- G. Provide a separate proposal for an extended warranty and maintenance service contract for consideration by OWNER.
 - 1. Length of Contract: Five years
 - 2. Submit payment terms and conditions with proposal.

PART 2 - PRODUCTS

2.1 PHYSICAL ACCESS CONTROL SYSTEM

- A. This specification is based on a system manufactured by Avigilon Security.
 - 1. Provide all AC/IDS access control hardware and software as standard catalog product offering.
 - 2. Exception: Controlled devices, such as electric locks, door actuators, etc., are specified elsewhere.

2.2 INPUT/OUTPUT DEVICES

- A. Card Readers:
 - 1. Reader Technology: As specified by selected card technology; compatible with PACS control panels.
 - 2. The readers shall offer multiple models and/or styles to fit various installation and application requirements including:
 - a. Rugged, weatherized enclosures rated for indoor and outdoor mounting.
 - b. Rated for mounting on metal and non-metal surfaces.

- c. Provide audible and visual indicators for reader status and validation of granted and denied access.
- 3. Reader shall be AptiQ M15 at all locations. Reader shall include license_
- 4. Door position switch shall be Allegion# 679-05 HM (see door hardware specification).

2.3 DUAL READER INTERFACE BOARD

- A. Reader interface board shall be Avigilon# AC-MER-CONT-2DR (number boards as required) and shall be installed in an enclosure consistent with the environment. Input boards shall only be installed in enclosure and shall be connected to controller as required.

2.4 INTELLIGENT CONTROLLER

- A. Intelligent controller shall be Allegion# PIM400-1501-LC and shall be installed in an enclosure consistent with environment. Controllers shall only be installed in enclosure and shall be connected to LAN as required. Provide quantity as required.
- B. Enclosure shall include a tamper monitor to notify owner's security department central command center when the enclosure is opened. Monitor shall be connected to access control system as required.
- C. Enclosure shall include a min/ max temperature sensor to notify owner's security department central command center when the enclosure is being subjected to temperatures outside the range to be defined by owner's security department. Sensor shall be connected to access control system as required.
- D. Intelligent controller shall be connected to owner's network as required. Contractor shall furnish and install all necessary wiring, cabling, labor, tools, equipment, programming, connections and ancillary materials required to connect to owner's existing LAN and owner's existing access control system head-end.

2.5 POWER SUPPLIES

- A. Power supplies shall be as manufactured by Altronix or Securitron and shall be mounted above access control panels

PART 3 - EXECUTION

3.1 SECURITY CONTRACTOR

- A. The SECURITY CONTRACTOR shall be a local installation and service organization, currently recognized as a factory authorized integrator by the manufacturer of the specified system.
- B. The SECURITY CONTRACTOR shall provide a minimum of (3) references whose systems are of similar complexity and have been installed and maintained by the SECURITY CONTRACTOR in the last (5) years.

- C. At time of bid, the SECURITY CONTRACTOR shall be licensed by the state or local jurisdiction to perform security work within the state. Contractors who have security licenses or permits pending shall not be considered acceptable for bidding on this project.
- D. The SECURITY CONTRACTOR shall assure that all personnel working on the project are registered with the state or local jurisdiction Systems Licensing Board as provided for by current state statutes.
- E. At the time of bid, the SECURITY CONTRACTOR shall provide satisfactory evidence of liability insurance and Workmen's Compensation coverage for employed personnel as required by law.

3.2 PROJECT MANAGEMENT

- A. The SECURITY CONTRACTOR shall provide an on-site, factory-trained technician to assist, advise and manage installing personnel.
- B. All of the SECURITY CONTRACTOR'S personnel and operating forces including subcontractors and delivery personnel, shall be made aware of, and shall comply at all times, with the regulations, project requirements, and directions of responsible OWNER personnel.

3.3 PERSONNEL

- A. The SECURITY CONTRACTOR'S personnel shall be qualified to accomplish all work promptly and satisfactorily. The OWNER shall be advised in writing of all designated service and support personnel responsible for installation as well as pre and post warranty service.
- B. The SECURITY CONTRACTOR shall provide proof that designated service and support personnel have successfully completed the appropriate level of both hardware and software training offered by the manufacturer for installation and maintenance of the specified system.

3.4 INSTALLATION

- A. The SECURITY CONTRACTOR shall install all system components and appurtenances in accordance with the manufacturer's specifications, referenced practices, guidelines, and applicable codes. Provide all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signal, communications, and data transmission line grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
- B. All wiring is to be installed in dedicated conduit throughout. Cable shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring.
- C. All low voltage wiring outside the control console, cabinets, boxes, and similar enclosures, shall be plenum rated where required by code.
- D. All wiring conductors connected to terminal strips shall be individually numbered and each cable or wiring group being extended from a panel or cabinet to a building mounted device shall be identified with the name and number of the particular device as identified and shown on building drawings.
- E. All exposed wiring inside and outside the control console, cabinets, boxes, and similar enclosures, shall be dressed down neatly and secured with wiring cleats or wire ties.

- F. All exposed metallic flexible conduit and armored cable shall be dressed down neatly and secured with low profile, metal fasteners.
- G. All cabinets, boxes, and similar enclosures containing security system components and/or cabling and which are easily accessible to employees or to the public shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible.
- H. All junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamper proof screws.
- I. End-of-Line resistors shall be installed at the field device location and not at the controller panel location.
- J. System devices identified on building drawings are intended to generally indicate areas where such devices are to be located. Security Contractor shall be responsible for determining final location of these devices in accordance with OWNER'S requirements.

3.5 COMMISSIONING AND TRAINING

- A. The SECURITY CONTRATOR is required to place entire system into full and proper operation as designed and specified.
 - 1. Verify that all hardware components are properly installed, connected, communicating, and operating correctly.
 - 2. Verify that all system software is installed, configured, and complies with specified functional requirements.
- B. The SECURITY CONTRACTOR shall perform final acceptance testing in the presence of OWNER'S representative, executing a point by point inspection against a documented test plan that demonstrates compliance with system requirements as designed and specified:
 - 1. Submit documented test plan to OWNER at least (14) days in advance of acceptance test, inspection, and check-off.
 - 2. Conduct final acceptance tests in presence of OWNER'S representative, verifying that each device point and sequence is operating correctly and properly reporting back to control panel and control center.
 - 3. Acceptance by Owner is contingent on successful completion of check-off; if check-off is not completed due to additional work required, re-schedule and perform complete check-off until complete in one pass, unless portions of system can be verified as not adversely affected by additional work.
 - 4. The system shall not be considered accepted until all acceptance test items have been successfully checked-off. Beneficial use of part or all of the system shall not be considered as acceptance.
- C. The SECURITY CONTRACTOR shall provide system operations, administration, and maintenance training by factory trained personnel qualified to instruct:
 - 1. OWNER will designate personnel to be trained.
 - 2. Provide printed training materials for each trainee including product manuals, course outline, workbook or student guides, and written examinations for certification.
 - 3. Provide hands-on training with operational equipment.
 - 4. Training shall be oriented to the specific system being installed under this contract as designed and specified.

END OF SECTION

SECTION 26 90 00

STRUCTURED CABLING 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.
- B. Section 26 01 01 "Basic Electrical Requirements".
- C. Section 26 05 26 "Grounding and Bonding for Electrical Systems".
- D. Section 26 05 29 "Hangers and Supports for Electrical Systems".
- E. Section 26 05 33 "Raceways and Boxes for Electrical Systems"
- F. Section 26 05 44 "Sleeves and Seals for Electrical Raceways and Cabling"
- G. Section 26 05 53" Identification for Electrical Systems"

1.2 SUMMARY

- A. All work under this specification section to be performed by a qualified telecommunications contractor as defined in this section. This includes, but is not limited to, cabling installation, cabling termination, equipment installation, system component labeling, owner coordination, etc. **All work performed by a contractor who does not meet the contractor qualifications as defined in this section will be replaced at no expense to the owner.**
- B. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling at the building. Backbone and horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.
- C. The Horizontal (workstation) Cabling System shall consist of 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet as shown on the plans. The cables shall be installed from the Work Area Outlet to the Telecommunications Room location as called for, and routed to the appropriate rack serving that area and terminated as specified in this document.
- D. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Telecommunications contractor as detailed in this document or as required for a fully functional system as intended.
- E. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. Any/ all work called for in this document or the attachment shall be included in the bid price as if called for in both this document and any/ all attachments. The successful vendor shall meet or exceed all requirements for the cable system described in this document

F. Section Includes:

1. Patch cords.
2. Telecommunications outlet assemblies.
3. Horizontal (workstation) cabling and terminations.
4. Cable identification.
5. Cable connecting hardware.
6. Cross-connects.
7. Patch panels.
8. Telecommunications equipment racks, cabinets and enclosures.
9. Cable management system.
10. Optical fiber panels/ enclosures, patch panels and terminations.
11. Backbone cabling.
12. Telecommunications mounting elements.
13. Backboards.
14. Copper cable protection units.
15. Copper cable punch-down blocks.
16. Grounding.
17. Firestopping.

G. Related Requirements:

1. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association (latest edition of applicable sections), all local codes, requirements of authority having jurisdiction, and present manufacturing standards.
2. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
3. All modular jacks, patch cords, patch panels and CAT6 cable performance shall be verified (not just tested) by a third party to be category 6 component and channel compliant.
4. Regulatory References:
 - a. NFPA 70/ NEC (latest edition): National Electrical Code.
 - b. ANSI J-STD-607 (latest edition): Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - c. TIA/EIA-606 (latest revision): Administration Standard for Telecommunications Infrastructure.
 - d. UL 969 (latest revision): Marking and Labeling Systems.
 - e. NECA 1 (latest edition): Standard Practice of Good Workmanship in Electrical Construction.
 - f. BICSI TDMM (latest edition): Telecommunications Distribution Methods Manual.
 - g. TIA/EIA-569 (latest edition): Commercial Building Standard for Telecommunications Pathways and Spaces.
 - h. TIA/EIA-568 (latest edition): Cabling Standard.
 - i. All other regulatory references noted in this document.
5. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
6. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project.

H. ALL CABLE/ DEVICE/ FACEPLATE COLORS SHALL BE COORDINATED, IN WRITING, WITH OWNER/ ARCHITECT PRIOR TO ORDERING.

1.3 WORK INCLUDED

- A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations and setup necessary to complete the installation of this structured cabling system in compliance with the specifications, drawings and applicable codes/ regulatory references. The Telecommunications contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.
- B. The work shall include, but not be limited to the following:
 - 1. Furnish and install a complete telecommunications wiring infrastructure.
 - 2. Furnish, install, and terminate **ALL** UTP and Optical Fiber cable.
 - 3. Furnish and install all wall plates, jacks, patch panels, punch-down blocks and equipment room patch cords.
 - 4. Furnish and install all required cabinets and/or racks and/ or enclosures as required or as indicated.
 - 5. Perform link or channel testing (100% of horizontal and/or backbone links/ channels) and certification of all components.
 - 6. Furnish test results of all cabling to the owner in electronic (searchable PDF file) and paper format, listed by each closet, then by workstation ID with the close-out documents.
 - 7. Adhere and comply with all requirements of connectivity and cabling manufacturer Certification programs.
 - 8. Provide owner training and documentation.
 - 9. Coordinate with the owner and the engineer for the required telecom room and equipment identification, conduit routes and identifications, cable identification (at the rack and at the work area). Provide and install labeling for all cables using the owner approved labeling scheme.
 - 10. Furnish any other material required to form a complete system.

1.4 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. LAN: Local Area Network.
- C. CLAN: Campus Local Area Network.
- D. RCDD: Registered Communications Distribution Designer.
- E. EF: Entrance facility.
- F. ER: Equipment Room.
- G. MDF: Facility Main Distribution Frame. May include the Entrance Facility equipment and/ or the Equipment Room equipment.
- H. IDF: Intermediate Distribution Frame.
- I. EMI: Electromagnetic Interference.
- J. Cross-connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

- K. IDC: Insulation Displacement Connector.
- L. UTP: Unshielded Twisted Pair.
- M. Consolidation point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- N. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/ connectors.
- O. Outlet/ connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- P. WAP: Wireless Access Point

1.5 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/ connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.
 - 1. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 - 2. Bridged taps and splices shall not be installed in the horizontal cabling.
 - 3. Splitters shall not be installed as part of the optical fiber or copper cabling system (excluding coaxial cable).
- B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet of patch cord to the workstation equipment or in the horizontal cross-connect.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications department and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/ connector locations with location of power receptacles at each work area.
- C. Coordinate typical labeling configuration with owner in writing prior to implementing.
- D. Coordinate cable pathway routings with electrical contractor and all other trades.

1.7 SUBMITTALS

- A. Contractor shall provide 7 hard copies and an electronic copy (searchable PDF file) of all submittal data required including Product Data, Shop drawings, Informational submittals and samples. Submittals will not be reviewed until complete Structured Cabling submittal package is received.

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- B. The Structured Cabling contractor shall check all suppliers' submittals regarding measurements, capacity, performance and details to satisfy him/ herself that they conform to the intent of the contract drawings and specifications. Submittals package shall bear the stamp of approval of the Structured Cabling contractor as evidence that the submittals have been checked by him/ her. Submittals will not be reviewed without the Structured Cabling contractor's stamp.
- C. See Section 26 01 01 for additional submittal requirements.
- D. Product Data: For each type of product including but not limited to: Patch cords, jacks, faceplates, cables, patch panels, racks/ cabinets
 - 1. Work shall NOT proceed without the engineer's approval of the submitted items.
 - 2. For all cable types used include:
 - a. Performance characteristics.
 - b. Nominal outside diameter.
 - c. Minimum bending radius.
 - d. Maximum pulling tension.
 - 3. For all racks/ cabinets and associated accessories include:
 - a. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
 - b. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- E. Shop Drawings:
 - 1. Submit a typical outlet assembly and labeling configuration.
 - 2. System Labeling Schedules:
 - a. Systems Labeling Schedule method shall be approved by owner, in writing, prior to implementation.
 - b. Provide a typical Systems Labeling Schedule sampling with submittals.
 - 3. Cabling administration drawings and printouts.
 - 4. Wiring diagrams to show typical wiring schematics including the following:
 - a. Cross-connects.
 - b. Patch panels (copper and fiber)
 - c. Patch cords and jumpers.
 - d. Work area outlet.
 - e. Active network equipment.
 - 5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
 - 6. Cable pathway layout, showing raceway route and type (cable tray, J-hooks, conduit, sleeves and pullboxes) to scale, with relationship between the pathway and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to side of cable trays and J-hook pathway.
 - c. Vertical elevation of pathway above the floor or bottom of ceiling structure.

- d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray/ J-hooks and support elements.
 - e. Load calculations to show dead and live loads as not exceeding manufacturer's rating for conduit support elements.
- 7. Detail equipment assemblies and indicate dimensions, weights, loads, recommended clearances, method of field assembly, components, and location and size of each field connection.
- 8. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
- 9. Grounding: Submit a scale drawing of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.
- 10. Contractor shall include in the submittal package 1-1/2" scale equipment rack elevations (front) for all equipment racks/ cabinets. Elevations must include and identify (by manufacturer and model# where applicable) the following:
 - a. Individual equipment rack identification
 - b. All rack-mounted equipment
 - c. All rack-mounted cable management
 - d. All rack-mounted Power Distribution Units
 - e. All rack-mounted ground bars
 - f. All blank filler plates
 - g. All rack mounted Uninterruptable Power Supplies (UPS)
- 11. Contractor shall include in the submittal package 1/2" scale drawings of each telecom room. Drawings must include and identify (by manufacturer and model# where applicable) the following:
 - a. All equipment rack(s) and clearances.
 - b. All backboard(s).
 - c. All cable tray/ cable runway.
 - d. Wall mounted ground bar.
 - e. All raceway penetrations.
 - f. All riser conduits.
 - g. All punch-down blocks.
 - h. All floor or wall-mounted Uninterruptable Power Supplies (UPS).
 - i. Receptacle locations.
 - j. All fire-stopping material/ fittings
 - k. All other equipment indicated on drawings or existing (where applicable).
- 12. Contractor shall include in the submittal package 1/2" scale interior elevations of all walls in each Comm room. Elevations must include and identify (by manufacturer and model# where applicable) the following:
 - a. All backboards.
 - b. All wall mounted equipment.
 - c. All raceway penetrations.
 - d. All riser conduits.
 - e. All wall mounted cable management (D-rings).
 - f. All backbone cabling.
 - g. All receptacles.
 - h. All punch-down blocks.
 - i. Wall mounted ground bar(s).
 - j. All fire-stopping material/ fittings.

F. INFORMATIONAL SUBMITTALS

1. The following informational submittal information must be provided with the submittal package:

- a. Qualification Data: For all telecommunications contractor's personnel on site, qualified layout technicians, installation supervisor, Installers, telecommunications contractor's field quality inspector and RCDD. Personnel qualification data shall include all BICSI certifications as well as all current cabling/ connectivity manufacturer's certifications.
 - 1) Contractor shall submit names of all personnel to be performing work related to this project
 - 2) Contractor shall submit a copy of the current cabling/ connectivity manufacturer's certification documents for all contractor personnel to be involved with this project.
 - 3) Contractor shall submit a copy of all BICSI certification documents for all contractor personnel to be involved with this project.
- b. Seismic Qualification Certificates: For equipment frames 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. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - 3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- c. Contractor must submit the following information regarding the 3 projects of similar size and scope (see "Quality Assurance"):
 - 1) Project name.
 - 2) Project location.
 - 3) Project owner. Include contact information (name, address, telephone and e-mail) for owners IT department or responsible party as it relates to structured cabling.
 - 4) Approximate value of project structured cabling.
 - 5) Approximate drop count.
 - 6) Contact information (including name, address, telephone and e-mail) of electrical or general contractor directly responsible for the structured cabling subcontractor.
- d. Contractor must submit a sample of the labeling system for all outlets, cables and patch panels.

G. Samples: jacks, jack assemblies, icons, cable (1 foot section), patch cable (3 foot length) and faceplate. Provide one of each type and size of each product submitted.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance data: For splices and connectors to include in maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

- C. System Labeling Schedules: Electronic copy of labeling schedules in searchable PDF file format.
- D. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
- E. All testing records.
- F. All as-built drawings.
- G. All warranty materials.
- H. Other records as called for within this specification.

1.9 MAINTENANCE 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. Patch cables: Ten of each length used.
 - 2. Jacks: Ten of each type used.
 - 3. Faceplates: Two of each type/ port capacity used.
 - 4. 4 pair UTP Cable: One 500ft reel of each type used.
 - 5. Patch-Panel units: One of each type used.
 - 6. Rack filler panels: One of each type used.
 - 7. Power distribution units: One of each type used.
 - 8. Punch-down blocks: One of each type used.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: The successful telecommunications contractor shall be a company specializing in communication cabling installation and shall have been in business for a minimum of 5 years under the same name and with the same board of directors/ management. Contractor must have successfully completed a minimum of 3 projects of similar size and scope within the last 5 years. At least 30 percent of the copper installation and termination crew must be certified by BICSI **and** the cable/connectivity manufacturer with a Technicians Level of Training. At least 10 percent of the optical fiber installation and termination crew must be certified by BICSI **and** the fiber cable/ connectivity manufacturer in optical fiber installation and termination practices. The contractor must have an RCDD on staff in responsible charge of the project. Provide all contact information for the RCDD as this will be the point of contact for the project.
 - 1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of a BICSI certified Commercial Installer, Level 2, who shall be present at all times when work of this Section is performed at Project site.
 - 3. Contractor's field quality inspector shall be the RCDD who is in responsible charge of the project or the on-site installation supervisor. **Contractor's field quality inspector shall provide biweekly on-site inspection reports to the engineer documenting this discipline's project progress.** These reports shall be submitted to adam@eegrpinc.com. Report shall include work that has been completed, work that is in progress, work remaining and estimated date of completion for each phase of work for

the project. Report shall include photographs of completed work and work in progress. Report shall include telecommunications contractor's personnel on-site for the duration of time included in the report.

4. Structured cabling contractor shall have, on site for final inspection, the RCDD who is in responsible charge of the project or the on-site installation supervisor. If one of the requested personnel is not present at the final inspection, the structured cabling contractor will be charged for time (\$125.00/ hour) and mileage (\$0.56/ mile) for the Jack R. Morgan Engineering, Inc. representative for the missed inspection. This charge must be paid prior to any subsequent visits to the site.
 5. Testing supervisor shall be currently certified by BICSI as an RCDD and shall be on-site to supervise all testing.
- B. The cabling/ connectivity manufacturer shall extend a manufacturer's warranty for all products installed, this project, to the end user once the telecommunications contractor fulfills all requirements under this specification. See section 3 of this document for full warranty requirements.
 - C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
 - E. Grounding: Comply with ANSI-J-STD-607-A.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and receipt of products shall be at the site.
- B. Cable shall be stored according to manufacturer's recommendations at a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable shall be stored off site at the contractor's expense.
- C. If the telecommunications contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner.
- D. Test all cables upon receipt at Project site.
 1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
 2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in closeout submittals.
 3. Test each pair of UTP cable for open and short circuits.

1.12 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install ANY cables or connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.13 DRAWINGS

- A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the telecommunications contractor in bidding the job. The telecommunications contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications and provide a fully functional system as intended.
- B. The telecommunications contractor shall verify all dimensions at the site and be responsible for their accuracy.
- C. Prior to submitting the bid, the telecommunications contractor shall call the attention of the Engineer to any materials or apparatus the telecommunications contractor believes to be inadequate and to any necessary items of work omitted.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS

- A. Due to the nature and type of communications all products, including but not limited to faceplates, jacks, patch panels, racks, punch-down blocks, and patch cords, for the purpose of this document, shall be manufactured by Leviton. All copper cable products shall be manufactured by Berktek. All fiber cable products shall be manufactured by Corning.

2.2 TELECOMMUNICATIONS OUTLET/CONNECTORS (CAT6)

- A. Work area cables shall each be terminated at their designated work area location in the connector types specified on drawings/ described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.
- B. The Telecommunications Outlet Assembly shall accommodate a minimum of two (2) modular jacks plus any additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary
- C. A blank filler will be installed when extra ports are not used.
- D. A dust cap shall be provided on all modular jacks with the circuit number on the identifier strip.
- E. Multiple jacks that are identified in close proximity on the drawings (but not separated by a physical barrier) may be combined in a single assembly. The telecommunications contractor shall be responsible for determining the optimum compliant configuration based on the products proposed.
- F. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the telecommunications contractor shall submit the proposed configuration for each outlet assembly for review by the owner.
- G. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA-606-A standard specifications. Labels shall be printed using standard connectivity manufacturer's label program or using a printer such as a Brady hand held printer. **Hand printed labels shall NOT be accepted.**

H. Workstation Outlets shall be as specified on drawings with connector and faceplate.

1. Jacks shall:

- a. Be 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- b. Meet category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-B.2-1. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory.
- c. Use dual reactance modular contact array.
- d. Have low emission IDC contacts.
- e. Use standard termination practice using 110 impact tool.
- f. Be backwards compatible to Category 3, 5, and 5e.
- g. Be center tuned to category 6 test specifications.
- h. Dust covers shall be used on each termination.
- i. Be as specified on drawings. Jack and icon color to be selected by owner/architect.

2. Faceplate shall:

- a. Be as manufactured by connectivity manufacturer.
- b. Be UL listed and CSA certified.
- c. Be available in single-gang or dual-gang.
- d. Shall provide easy access for adds, moves, and changes by front removal of jack modules.
- e. Possess recessed designation windows to facilitate labeling and identification.
- f. Shall include a clear plastic cover to protect labels in the designation window.
- g. Have mounting screws located under recessed designation windows.
- h. Comply with ANSI/TIA/EIA-606-A work area labeling standard.
- i. Allow for the UTP modules to be inverted in place for termination purposes.
- j. Be manufactured by an ISO 9001 registered company.
- k. Be compliant with the above requirements along with the following when incorporating optical fiber:
 - l. Be a low profile assembly,
- m. Incorporate a mechanism for storage of cable and fiber slack needed for termination,
- n. Position the fiber optic couplings to face downward or at a downward angle to prevent contamination.
- o. Incorporate a shroud that protects the fiber optical couplings from impact damage.
- p. Be Stainless steel as specified on drawings and complying with requirements in section 26 27 26.
- q. For use with snap-in jacks accommodating any combination of UTP, optical fiber and coaxial work area cords.
- r. Flush mounting jacks.
- s. Shall have window for snap-in, clear-label covers and machine-printed paper inserts.

2.3 UTP CABLE (CAT6)

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. UTP cable shall be as manufactured by Berktek

C. Performance:

1. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
3. 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.
4. Grounding: Comply with J-STD-607-A.

D. Description: 100-ohm, four-pair UTP, covered with a thermoplastic jacket shall:

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: CMP or CMR.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
5. Be plenum rated and meet applicable requirements of ANSI/ICEA S-80-576 in all locations where the cable path crosses any space rated as a return air plenum. All 4 pairs must be insulated with F.E.P. No constructions that use mixed insulation materials for a single cable pathway will be allowed.
6. Consist of (4) 23 AWG twisted pairs.
7. Be suitable for the environment in which they are to be installed.
8. Have an overall diameter no larger than 0.250 inches.
9. Have an ultimate breaking strength measured in accordance with ASTM D 4565 and shall be no less than 400 N minimum.
10. Shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
11. Be third party verified to meet ANSI/TIA/EIA-568-B.2.
12. Shall be color coded as required to meet owners color coding scheme.
13. Be as specified on drawings.

2.4 UTP CABLE HARDWARE (CAT6)

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. UTP cable hardware shall be as manufactured by Leviton
- C. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

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- D. Connecting Blocks: 110-style IDC for Category 5e and Category 6. Provide blocks for the number of cables terminated on the block, plus 10 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- F. Patch Panel shall:
 - 1. House multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 2. Have number of Jacks required to provide one for each four-pair UTP Data and Voice cable indicated plus 10 percent spare.
 - 3. **Have Data, Voice, Building automation and security related cables terminated on separate patch panels.**
 - 4. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
 - 5. Use low emission IDC contacts
 - 6. Use dual reactance technology to enhance the signal-to-noise ratio
 - 7. Require standard termination practices using a 110 impact tool
 - 8. Use a single piece IDC housing designed to accept larger Category 6 conductors
 - 9. Support both T568B and T568A wiring
 - 10. Include easy to follow wiring labels
 - 11. Include label fields
 - 12. Allow for the use of icons
 - 13. Include full length metal rear cable management
 - 14. Be available in standard or high density
 - 15. Be backward compatible to category 3, 5 and 5e
 - 16. Be center tuned to category 6 test specifications
 - 17. Be accompanied by horizontal cable management in a ratio of one rack unit of wire management per 24 ports of patch panel.
 - 18. Be as specified on drawings.
- G. Copper Patch Cords:
 - 1. Patch Cords shall:
 - a. Be factory-made, four-pair cables in standard lengths; terminated with eight-position modular plug at each end.
 - b. Have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 - c. Have color-coded boots for circuit identification.
 - d. Use 8 position connector with impedance matched contacts and designed using dual reactance.
 - e. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2-1 standard.
 - f. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1
 - g. Be 100% factory tested to meet category 6 performance
 - h. Have ETL or any other nationally recognized 3rd party verification
 - i. Be center tuned to category 6 performance specifications by using paired bi-level contact array
 - j. Be capable of universal T568A or T568B wiring schemes

- k. Have a connector that maintains the paired construction of the cable to facilitate minimum untwisting of the wires.
 - l. Have a performance marking indelible label on the jacket (by the manufacturer).
 - m. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606A labeling specifications.
 - n. Have "snag-less" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief
 - o. Be available in three standard colors
 - p. Be backwards compatible to Category 3, 5, and 5e
 - q. Be manufactured by a ISO 9001 registered company.
 - r. Be color coded as directed by owner.
 - s. Be as manufactured by submitted cable or connectivity manufacturer.
 - t. The contractor shall not be required to provide patch cords for voice work area outlets.
2. Cross-connect copper Patch Cords: Factory-made, four-pair, category 6 cables in lengths as required; terminated with eight-position modular plug at each end. Equipment room cross connect patch cables shall be 12" in length
- a. Contractor shall provide one each patch cord for each Data and Voice cable terminated in telecom room. Cables shall be furnished in lengths as required to facilitate a neat and flexible installation.
3. Cross-connect fiber patch cords: factory made, single pair, multimode, 50/125 micrometer, or singlemode in lengths as required, terminated with type LC or MTP connectors. Verify connector type with owner prior to ordering.

2.5 COAXIAL CABLE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- 1. Superior Essex.
 - 2. Belden Inc.
 - 3. CommScope, Inc.
- B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
- C. RG-11/U: NFPA 70, Type CATV.
- 1. No. 14 AWG, solid, copper-covered steel conductor.
 - 2. Gas-injected, foam-PE insulation.
 - 3. Quad shielded with 100 percent aluminum polyester tape and minimum 60 percent aluminum braid.
 - 4. Jacketed with sunlight-resistant, black PVC or PE.
 - 5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.
- D. RG-6/U: NFPA 70, Type CATV or CM.
- 1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
 - 2. Quad shielded with 100 percent aluminum-foil shield and minimum 60 percent aluminum braid.
 - 3. Jacketed with black PVC or PE.
 - 4. Suitable for indoor installations.

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- E. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
 - 1. CATV Cable: Type CATV, or CATVP or CATVR.
 - 2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
 - 3. CATV Riser Rated: Type CATVR; or CATVP, CATVR, or CATV, complying with UL 1666.
 - 4. CATV Limited Rating: Type CATVX.

2.6 COAXIAL CABLE HARDWARE

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. Coaxial-Cable Connectors: Type BNC, 75 ohms; Type F, 75 ohms.

2.7 COPPER CABLE PROTECTION UNITS

- A. All copper circuits shall be provided with protection for any/ all copper cabling that penetrates the building envelope (including exterior wall mounted cameras, WAPs or data outlets). The protector shall be connected with a #4 AWG copper bonding conductor between the protector ground lug and the structured cabling ground point. Protector modules shall be housed in connector with cover and splice chamber and shall contain punch-down blocks of same style as specified elsewhere. Enclosure shall be consistent with the environment in which it is installed. Protector must be installed within 50ft of the building envelope penetration.
 - 1. Copper cable protection modules for Digital voice, Data and Security cabling shall be Circa# 4B1FS-240 or equal.
 - 2. Copper cable protection modules for P.O.T.S, Fire Alarm System and paging cabling shall be Circa# 4B1E or equal.

2.8 PATHWAYS

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. General Requirements: Comply with TIA/EIA-569-A.
- C. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- D. Cable Trays:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cablofil Inc.
 - b. Cooper B-Line, Inc.
 - c. WBT

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2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches (0.012 mm) thick.
 - a. Basket Cable Trays: 12 inches wide and 4 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.
 - b. Ladder Cable Trays: Nominally 24 inches wide, and a rung spacing of 8 inches.
 - c. Solid-Bottom Cable Trays: One-piece construction, nominally 12 inches wide. Provide with solid covers in locations with exposed structure.
- E. Conduit and Boxes: Comply with requirements in Section 26 05 33.
 1. Outlet boxes shall be no smaller than 4 inches wide, 4 inches high, and 2-1/2 inches deep.

2.9 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches sheets to cover area indicated on drawings.

2.10 EQUIPMENT FRAMES

- A. Subject to compliance with requirements, provide product indicated on drawing.
- B. General Frame Requirements:
 1. Equipment racks/ cabinets shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Horizontal Wire management shall also be mounted above and below each patch panel and/or piece of equipment on the rack at a ratio of 1 rack unit of horizontal cable management per each rack unit of patching or equipment or 1 rack unit of horizontal cable management per 24 ports of patching or active network equipment (whichever is greater). The rack shall include mounting brackets for cable tray ladder rack/ cable runway to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management. Contractor shall provide complete dimensioned rack assembly details showing all components including part numbers as called for in as built drawings submittals section of this document.
 2. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
 3. Module Dimension: Width compatible with EIA 310-D standard, 19-inch panel mounting.
 4. Finish: Manufacturer's standard, baked-polyester powder coat.
- C. Floor-Mounted Racks shall:
 1. Be modular type steel construction. vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and PDU.
 2. Have Baked-polyester powder coat finish.

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3. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
4. Have top cable trough with waterfall and built in patch/ horizontal cable distribution separator.
5. Have EIA hole pattern on front and rear.
6. Provide floor and ceiling access for cable management and distribution.
7. Provide pre-drilled base for floor attachment of rack.
8. Be available in standard color of black.
9. Be manufactured by an ISO 9001 registered company.
10. Be furnished with manufacturer's grounding kit.
11. Use blank panels where required

D. Modular Freestanding Cabinets shall:

1. Have removable and lockable side panels.
2. Have hinged and lockable front and rear doors.
3. Have adjustable feet for leveling.
4. Have screened ventilation openings in the roof and rear door.
5. Provide cable access provisions in the roof and base.
6. Have grounding bus bar.
7. Have integral, 550-cfm fan with filter.
8. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
9. Have top cable trough with waterfall and built in patch/ horizontal cable distribution separator.
10. Have EIA hole pattern on front and rear.
11. Provide floor and ceiling access for cable management and distribution.
12. Provide pre-drilled base for floor attachment of rack.
13. Be available in standard color of black.
14. Be manufactured by an ISO 9001 registered company.
15. Be furnished with manufacturer's grounding kit.
16. Use blank panels where required
17. Baked-polyester powder coat finish.
18. All cabinets keyed alike.

E. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.11 POWER DISTRIBUTION UNITS

A. Power Distribution Units shall:

1. Comply with UL 1363.
2. Be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Be rack mounted.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.

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6. Be provided in each rack/ cabinet as required to provide one 5-20R outlet for each 24 cables terminated at the rack.
7. Shall NOT have on/ off switch.
8. Have integral amp/ current meter.
9. Have integral surge suppression with a minimum rating of 26 kA.
10. Surge suppression protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes shall be not more than 330 V.

B. Vertical Power Distribution Unit

1. The vertical power distribution unit shall be equipped with a minimum of ten (10) 3-prong, NEMA 5-20R, 120 VAC outlets, 10' cord.
2. The vertical power distribution unit shall be equipped with surge protection with a 20 Amp current limit.
3. The vertical power distribution unit shall be equipped with a bracket that enables it to be mounted on a 19" rack, cabinet or wall mount bracket without modification.

2.12 **GROUNDING**

- A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB) furnished and installed by the electrical contractor. This backbone shall be used to ground all telecommunications cable shields (where applicable), equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor.
- B. Each distribution frame location (backboard location) shall be equipped with a telecommunications ground bus bar (TGB). Each TGB shall be connected to the building electrical entrance grounding facility with #3 AWG in 1"C. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.
- C. All racks, cabinets, enclosures, cable sheaths, metallic strength members, splice cases, cable trays, sleeves, conduits, etc. entering or residing in the EF, ER, MDF or IDF shall be grounded to the respective TGB using conductors as shown on the plans or called for elsewhere in the specifications. Telecommunications grounding conductors shall be a minimum of #6 AWG.
- D. All cable tray sections shall be connected to building ground.
- E. All metallic components of fire-stop fittings and conduits shall be connected to system ground.
- F. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.
- G. Comply with requirements in Section 26 05 26 for grounding conductors and connectors.
- H. Telecommunications Main Bus Bar:
 1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.

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3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

- I. Comply with J-STD-607-A.

2.13 FIRE-STOP

- A. Fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.
- C. All through penetrations shall be fire-stopped with Wiremold flamestopper (or equal) adjustable fire-stop fitting with integrated intumescent barrier.
- D. Fire-stop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the fire-stop system(s).

2.14 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 26 05 53.

2.15 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.16 SOURCE QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified, third party testing agency to evaluate all cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
- E. Cable will be considered defective if it does not pass tests and inspections.

- F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WORK AREA OUTLETS

- A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.
- B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.
- C. Pair untwist at the termination shall not exceed one-half inch.
- D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the cable
- E. The cable jacket shall be maintained to within one inch of the termination point.
- F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).
- G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.2 INSTALLATION OF EQUIPMENT ROOM FITTINGS

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- D. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service departments.
 - 1. Meet jointly with owner's telecommunications and LAN equipment departments to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings and distribute them to other participants.
 - 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment as directed by owner's IT department.

4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room. Contractor shall coordinate with owner's IT, Security and maintenance departments and facilitate inter-department coordination for acceptable configuration of shared space in telecom rooms.
- E. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- F. Racks/ cabinets shall be securely attached to the concrete floor using a minimum 3/8" hardware or as required by local codes.
- G. Racks/ cabinets shall be placed with a minimum of 36 inch clearance from the walls or other equipment on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall or equipment behind and in front of the row of racks and from the wall or equipment at each end of the row.
- H. All racks/ cabinets shall be grounded to the telecommunications ground bus bar in accordance with other sections of this document.
- I. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
- J. The contractor shall install 24" ladder cable tray from wall to each rack/ cabinet.

3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified elsewhere in this document. Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Section 26 05 33 for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Secure conduits to backboard when entering room from overhead.
 4. Extend conduits a minimum of 6 inches above finished floor.
 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 WIRING METHODS

- A. Wiring Method: Install cables in raceways, cable trays and J-hooks except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 26 05 33.
- B. Conceal conductors and cables in accessible ceilings, walls and floor
- C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- D. Wiring within Enclosures:
 - 1. Bundle, lace, and train cables within enclosures.
 - 2. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
 - 3. Provide and use lacing bars and distribution spools.
 - 4. Install conductors parallel with or at right angles to sides and back of enclosure.

3.5 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling installation:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Cable shall be installed in accordance with manufacturer's recommendations, best industry practices and these specifications.
 - 3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
 - 4. Cable raceways shall not be filled greater than the ANSI/TIA/EIA-569-A maximum fill for the particular raceway type or 40% (whichever is less).
 - 5. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 6. Install 110-style IDC termination hardware as required for copper cables unless otherwise indicated.
 - 7. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 9. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable. Any cabling found to be damaged during installation shall be removed and replaced at no cost to owner.
 - 12. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.

13. In the communications equipment room, install a 10-foot long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
15. MUTOA shall not be used as a cross-connect point.
16. Consolidation points may be used only for making a direct connection to telecommunications outlet/ connectors and may only be used where specifically called for in the contract documents.
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to work station equipment.
 - b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
17. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
18. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
19. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
20. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 36 inch intervals. At NO point shall cable(s) rest on acoustic ceiling grids, ceiling panels, electrical conduits, fire alarm system conduits, structural elements, mechanical piping or ductwork.
21. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance
22. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
23. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling. See the plans for approximate support locations and requirements.
24. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
25. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
26. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
27. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.
28. Backbone cabling
 - a. Backbone cables shall be installed separately from horizontal distribution cables.
 - b. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.
 - c. Where backbone cables are installed in an air return plenum, riser rated cable shall be installed in metallic conduit.
 - d. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
 - e. All backbone cables shall be securely fastened to the sidewall of the telecom room.

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- f. Backbone cables spanning more than two floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
- g. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
- h. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

C. UTP Cable Installation:

- 1. Comply with TIA/EIA-568-B.2.
- 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

- 1. Comply with TIA/EIA-568-B.3.
- 2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
- 3. Verify termination type with owner prior to ordering.

E. Open-Cable Installation:

- 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
- 2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 36 inches apart.
- 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

- 1. Install plenum-rated cable only.
- 2. Install cabling after the flooring system has been installed in raised floor areas.
- 3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. UTP cable hardware installation

- 1. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.
- 2. Pair untwist at the termination shall not exceed one-half inch.
- 3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- 4. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- 5. The cable jacket shall be maintained as close as possible to the termination point.
 - a. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable

H. Optical Fiber hardware installation

1. Splice Trays:
 - a. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.
 - b. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
 - c. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
 - d. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
 - e. A maximum of 12 strands of fiber shall be spliced in each tray
 - f. All spare strands shall be installed into spare splice trays.
2. Adapter Plates/ fiber patch panels:

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.

- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53.
 - 1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- E. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 50 feet and at every cable pathway transition.
 - 3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 - 4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
 - 5. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.
- F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 5. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:
 - 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
 - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
 - 6. UTP Performance Tests:
 - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.

- 9) Propagation delay.
 - 10) Delay skew.
- 7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
- 8. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Perform tests and inspections.
- H. Tests and Inspections:
 - 1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 4. Optical Fiber Cable Tests:
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - b. Link End-to-End Attenuation Tests:

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- 1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, one Reference Jumper.
 - 2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
- I. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
 - J. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
 - K. End-to-end cabling will be considered defective if it does not pass tests and inspections.
 - L. Prepare test and inspection reports. All testing shall be performed by equipment that has been maintained and calibrated as directed by testing equipment manufacturer. Include calibration history with test and inspection reports.

3.9 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 26 05 44

3.10 FIRESTOPPING

- A. All fire-stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.11 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Section 26 05 44.
- B. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.
- C. All label printing will be machine generated by connectivity/ cabling manufacturer software using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on

each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

- D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.
- E. Labels shall be preprinted or computer-printed type.

3.12 DEMONSTRATION

- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

3.13 TESTING AND ACCEPTANCE

- A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
- B. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the connectivity/ cabling manufacturer Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
- C. Copper Channel Testing.
 - 1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance as specified in ANSI/TIA/EIA-568-B.2-1.
 - 2. Continuity – Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
 - 3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
 - 4. Category 6 Performance
 - a. Follow the Standards requirements established in ANSI/TIA/EIA-568-B .1, B.2-1
 - b. A Level III test unit is required to verify category 6 performance.
 - c. The basic tests required are:

- 1) Wire Map
- 2) Length
- 3) Attenuation
- 4) NEXT (Near end crosstalk)
- 5) Return Loss
- 6) ELFEXT Loss
- 7) Propagation Delay
- 8) Delay skew
- 9) PSNEXT (Power sum near-end crosstalk loss)
- 10) PSELFEXT (Power sum equal level far-end crosstalk loss)

D. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

E. System Documentation

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets and one (1) searchable PDF document to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.
3. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

F. Test Results

1. Test documentation shall be provided (in searchable PDF format) on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test

frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

2. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB's and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.
3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The telecommunications contractor must furnish this information in electronic form (flash drive or CD-ROM).
4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

3.14 AS-BUILT DRAWINGS

- A. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. Construction documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.
- B. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (PDF format) form.

3.15 WARRANTY

- A. Supplier will honor claims on this warranty for Life (which is defined as the usable life of the building and is referred to as the "Warranty Period" and shall be no less than 30 years).
- B. This warranty covers the copper and fiber optic permanent links of the network (as defined by ANSI/TIA/EIA-568-C.2 for CAT 5e, CAT.6, CAT 6A, ANSI/TIA/EIA-568-C.3 for Optical Fiber Cabling and Components): which includes the cable and connecting hardware.
- C. This warranty will be extended to include the entire channel.
- D. The network copper cabling infrastructure must be installed in accordance with TIA 568 Series Standards, and installed by Leviton Certified installers. The fiber cabling and components shall be installed by a Corning NPI certified installer.
- E. Each permanent link or channel in the network must be field tested in accordance with the TIA 568 series industry standard in force at the time of purchase AND the installed permanent links and channels must have passed all applicable TIA and manufacturer performance requirements.
- F. Appropriate Warranty Application form must be properly completed and submitted to Supplier prior to initiating the installation. The Warranty Submittal Form must be submitted within 10 days of installation completion.

- G. Copies of all certification test reports must be submitted as part of the Warranty Submittal Form, and be kept on file by the registrant to be re-submitted when requested by Supplier. Data must be saved in raw data and summary formats. Submitting the data via online upload, e-mail or on disc are the preferred methods for providing test data.
- H. The Campus Warranty provides that at the time of delivery, Premises Voice-Grade Cable and Outside Plant Cable products, when installed as part of a campus network along with copper and/or fiber cables from specified manufacturer for 100% of the premises LAN installation, will be free from defects in design, material, and manufacture and conform to manufacturer specifications in force at the time of purchase for a period of no less than thirty (30) years from the delivery date (the "Campus Warranty").
- I. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve you of these obligations.
- J. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for no less than thirty (30) years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal and/or backbone copper, and both the horizontal and the backbone optical fiber portions of the cabling system.
- K. The manufacturer and contractor shall provide a warranty on the physical installation.

3.16 CONTINUING MAINTENANCE

- A. The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall be performed by contractor that meets the qualifications outlined elsewhere in these Specifications.

3.17 FINAL ACCEPTANCE AND SYSTEM CERTIFICATION

- A. The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall be performed by an connectivity/ cabling manufacturer certified Integrator and shall be added to the warranty when registered with manufacturer. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from connectivity/ cabling manufacturer, registering the installation.

END OF SECTION