PROJECT MANUAL

A NEW BRANCH FOR:
CITIZENS PROGRESSIVE BANK
5031 Cypress Street (Hwy 80)
West Monroe, Louisiana 71291

THE ARCHITECTURE ALLIANCE GROUP LLC

ARCHITECTURE • DESIGN/BUILD • CONSTRUCTION MANAGEMENT

Date
September 20, 2024
Architect's Project Number
05-CPBWMB23

SET NUMBER

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CITIZENS PROGRESSIVE BANK
WEST MONROE BRANCH
5031 Cypress Street (Hwy 80)
WEST MONROE, LA 71291
Project No.: 05-CPBWMB23

INSTRUCTIONS TO BIDDERS

ARTICLE 1

DEFINITIONS

1.1 The Bidding Documents include the following:

Notice to Bidders
Instructions to Bidders
Louisiana Public Bid Form
General Conditions of the Contract for Construction, AIA Document 201, 2017 edition
Supplementary Conditions
Contract between Owner and Contractor, AIA Document A101, 2017 edition
Bid Bond Form
Geotechnical Service Report
Addenda issued during the bid period and acknowledged in the Bid Form.
Specifications, Divisions 1 thru 16 & dated September 20, 2024
Drawings Nos. T1.01 thru E6.02 of 33 sheets dated September 20, 2024.

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Document, A201, or in other Contract Documents are applicable to the Bidding Documents.

1.21 AIA Document A101-2017; In Section 6.2 Binding Dispute Resolution; The Litigation in a court of competent jurisdiction will be the method of binding dispute resolution.

1.22 AIA Document A101-2017; The contract terms, including the date of commencement of the work, date of substantial completion, contract sum owed and additional terms have not yet been determined and therefore are not specified. The apparent low bidder that has been awarded the project after the public bid will be issued these contract terms including construction time, notice to proceed, substantial completion, and liquidated damages per the construction documents and specifications.

1.3 Addenda are written or graphic instruments issued by the Architect prior to the openings of bids which modify or interpret the bidding documents by additions, deletions, clarifications, corrections and prior approvals.

1.4 A Bid is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein supported by data called for by the Bidding Documents.

1. 5 Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described as the Base, to which Work may be added for sums stated in Alternate Bids.

1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to the amount of the Base Bid if the corresponding change in project scope or materials or methods of construction described in the Bidding Documents is accepted.

1.7 A Bidder is one who submits a Bid for a prime contract with the Owner for the Work described in the proposed Contract Documents.

1.8 Sub-bidder is one who submits a bid to a Bidder for materials and/or labor for a portion of the Work.

1.9 Where the word "Architect" is used in any of the Documents, it shall refer to the Prime Designer of the project, and Architect, Engineer or Landscape Architect.

ARTICLE 2

BIDDER'S REPRESENTATION

2.1 Each Bidder by making his bid represents that:

2.1.1 He has read and understands the Bidding Documents and his Bid is made in accordance therewith.

2.1.2 This is a pre-bid conference on October 23, 2024, at 10:00 am.

He has visited the site and has familiarized himself with the local conditions under which the Work is to be performed. This is critical due to the amount of different locations and different type of restrooms

2.1.3 His Bid is based upon the materials, systems and equipment described in the Bidding Documents as advertised and as modified by Addenda. Contractor shall not rely on any verbal instructions during bidding unless issued in written Addendum.

2.2 The Bidder must be fully qualified under any state or local licensing law for Contractors in effect at the time and at the location of the Work before submitting his bid. In the State of Louisiana, Revised Statutes 37:2150, et seq. will be considered, if applicable. The Contractor shall be responsible for determining that all of his Sub-bidders or prospective Sub-contractors are duly

licensed in accordance with law.

ARTICLE 3

BIDDING DOCUMENTS

3.1 Copies

3.1.1 Complete Bidding Documents for this project are available in electronic form. They may be obtained with charge/deposit from Monroe City School Board.

3.1.2 Complete sets of Bidding Documents shall be used in preparing bids; neither the Owner nor the Architect assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.3 The Owner or Architect in making the Bidding Documents available on the above terms, do so only for the purpose of obtaining bids on the Work and do not confer a license or grant for any other use.

3.2 Interpretation or Correction of Bidding Documents

3.2.1 Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.

3.2.2 Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at the pre-bid conference to reach him at least ten days prior to the date for receipt of bids.

3.2.3 Any interpretation, correction or change of the Bidding Documents will be made by Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and bidders shall not rely upon such interpretations, corrections and changes.

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 No substitution will be considered unless written request for approval has been

submitted by the proposer and has been received by the Architect at least seven (7) days prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would 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 shall be final. All manufacturer's information shall be mailed or emailed. Absolutely no "faxed" information or request shall be considered.

3.3.3 If the Architect approves any proposed substitution, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

3.4 Addenda

3.4.2 Addenda will be posted and made available from TA2G Architecture Firm to all plan holders.

3.4.2 Printed Copies are not available from the Architect but arrangements can be made to obtain them through most reprographic firms. Plan holders are responsible for their own reproductive costs during construction.

3.4.3 Addenda shall not be issued within a period of seventy-two (72) hours prior to the advertised time for the opening bids, excluding Saturdays, Sundays, and any other legal holidays; however, if the necessity arises to issue and addendum modifying plans and specifications within the seventy-two hour (72) period prior to the advertised time for the opening of bids, then the opening of bids shall be extended exactly one week, without the requirement of re-advertising.

3.4.4 Each Bidder shall ascertain from the Architect prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge their receipt on the Bid Form.

ARTICLE 4

BIDDING PROCEDURE

4.1 Form and Style of Bids

4.1.1 Bids shall be submitted on the forms provided by the Architect.

4.1.2 All blanks on the bid form shall be filled in by typewriter or manually in ink.

4.1.3 Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.

4.1.4 Any interlineation, alteration or erasure must be initialed by the signer of the Bid or his authorized representative.

4.1.5 Bidders are cautioned to complete all alternates should such be required in the Bid Form. Failure to submit alternate prices will render the Proposal incomplete and shall reject entire bid.

4.1.6 Bidder shall make no additional stipulation on the bid form nor qualify his bid in any other manner.

4.1.7 The Bid shall include the legal name of Bidder and statement whether Bidder is a sole proprietor, a partnership, a corporation, or any other legal entity, and the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid submitted by an agency shall have a current Power of Attorney attached certifying agent's authority to bind Bidder.

4.1.8 On any bid in excess of fifty thousand dollars ($50,000.00), the Contractor shall certify that he is licensed under R. S. 37:2l50-2l63 and show his license number on the bid above his signature of his duly authorized representative.

4.2 Bid Security

4.2.1 No bid shall be considered or accepted unless the bid is accompanied by bid security in the amount of not less than five percent (5%) of the Base Bid and all additive alternates. The bid security shall be in the form of a certified check or cashier's check drawn on a bank insured by the Federal Deposit Insurance Corporation, or a bid bond written by a surety company licensed to do business in Louisiana, countersigned by a person who is under contract with the surety company or bond issuer as a licensed agent in this state and who is residing in this state and accompanied by appropriate power of attorney and in favor of the Monroe City School Board.

Bid security furnished by the Contractor shall guarantee that the Contractor will, if awarded the Work according to the terms of his proposal, enter into the Contract and furnish Performance and Payment Bonds as required by these Contract Documents, within fifteen (l5) days after written notice that the

instrument is ready for his signature.

Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as penalty.

4.2.2 The Owner will have the right to retain the bid security of Bidders until either (a) the Contract has been executed and bonds have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

4.3 Submission of Bids

Bids shall be submitted to Citizen Progressive Bank (Highway165) on November 14, 2024 @ 10:00 A.M.

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4.3.1 Bids shall be sealed in an opaque envelope and will be received until the time specified and at the place specified in the Notice to Bidders. It shall be the specific responsibility of the Bidder to deliver his sealed bid to Citizen Progressive Bank on Highway 165. Late delivery of a bid for any reason, including late delivery by United State Mail, or express delivery shall disqualify the bid. The bid envelope shall be identified on the outside with the name of the project, and the name, address, and license number of the Bidder.

4.3.2 Bids shall be deposited at the designated location prior to the time on the date for receipt of bids indicated in the Notice to Bidders, or any extension thereof made by Addendum. Bids received after the time and date for receipt of bids will be returned unopened.

4.3.3 Bidder shall assume full responsibility for timely delivery at location designated for receipt of Bids.

4.3.4 Oral, telephonic or telegraphic Bids or modifications to bids are invalid and will not receive consideration. Owner will not consider notations written on outside of Bid Envelope which have the effect of amending the Bid. Bids maybe received via bidexpress.com as indicated in notice to bidders advertisement.

4.4 Modification or Withdrawal of Bid

4.4.1 A bid may not be modified, withdrawn or cancelled by the Bidder during the time stipulated in the Advertisement for Bids, for the period following the time and bid date designated for the receipt of bids, and Bidder so agrees in submitting his Bid, except in accordance with Act 111 of 1983 which states, in

part, "Bids containing patently obvious mechanical, clerical or mathematical error may be withdrawn by the Contractor if clear and convincing sworn, written evidence of such errors is furnished to the public entity within forty-eight hours of the bid opening excluding Saturdays, Sundays and legal holidays".

4.4.2 Prior to the time and date designated for receipt of Bids, Bids submitted early may be modified or withdrawn only by notice to the party receiving Bids at the place and prior to the time designated for receipt of Bids.

4.4.3 Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

4.4.4 Bid Security shall be in an amount sufficient for the Bid as modified or resubmitted.

ARTICLE 5

CONSIDERATION OF BIDS

5.1 Opening of Bids

5.1.1 Citizens Progressive Bank will open the bids privately and inform all Contractors the results

5.2 Rejection of Bids

5.2.1 The Owner shall have the right to reject any or all Bids and in particular to reject a Bid not accompanied by any required bid security or data required by the Bidding Documents or a Bid in any way incomplete or irregular.

5.3 Acceptance of Bid

5.3.1 The Owner reserves the right to reject any and all bids.

5.3.2 It is the intent of the Owner, if he accepts any Alternates, to accept them in the order in which they are listed in the bid form. Determination of the low Bidder shall be on the basis of the sum of the Base Bid and the Alternates accepted. However, the Owner shall reserve the right to accept alternates in any order which does not affect determination of the low Bidder.

5.3.3 It is the intent of the Owner to award a contract to the lowest responsible Bidder in accordance with the requirements of the Bidding Documents, and if the bid

does not exceed the funds available.

ARTICLE 6

POST-BID INFORMATION

6.1 Submissions

6.1.1 At the pre-construction conference, the Contractor shall submit the following information to the Architect.

6.11.1 A designation of the Work to be performed by the Contractor with his own forces.

6.1.1.2 A breakdown of the contract cost into the 16 Divisions of the C.S.I. No payments will be made to the Contractor until this is received. The proprietary names and the suppliers of principal items or systems of material and equipment proposed for the Work.

6.1.1.3 A list of names of all Subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work. This shall be required no later than three (3) business days after receipt of bids.

6.1.2 The Contractor will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the proposed Subcontractors to furnish and perform the Work described in the Sections of the Specifications pertaining to such proposed Subcontractor's respective trades.

6.1.3 The Architect will notify the Contractor if either the Owner or the Architect, after due investigation, has reasonable and substantial objection to any person or organization on the Contractor's list of proposed Subcontractors. If there are objections, the Contractor shall submit alternative Subcontractor(s) for their approval.

6.1.4 Subcontractors and other persons and organizations proposed by the Bidder and accepted by the Owner and the Architect must be used on the Work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner and the Architect.

ARTICLE 7

PERFORMANCE AND PAYMENT BOND

7.1 Bond required

7.11 The Contractor shall furnish and pay for a performance and payment bond written by a company licensed to do business in Louisiana in an amount equal to 100% of the Contract amount. Surety must be listed currently on the U. S. Department of Treasury Financial Management Service List (Treasury List) as approved for an amount equal to or greater than the contract amount, or must be an insurance company domiciled in Louisiana or owned by Louisiana residents. If surety is qualified other than by listing on the Treasury list, the contract amount may not exceed fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance and may not exceed the amount of $500,000. However, a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A. M. Best's Key Rating Guide shall not be subject to the $500,000 limitation, provided that the contract amount does not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide nor fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance. The Bond shall be signed by the surety's agent or attorney-in-fact and countersigned by a person who is under contract with surety as a licensed agent in this State, and who is residing in this State.

7.2 Time of Delivery and Form of Bond

7.2.1 The Bidder shall deliver the required bond to the Owner simultaneous with the execution of the Contract.

7.2.2 The Bidder shall require the Attorney-in-Fact who executes the required bond on behalf of the surety to affix thereto a certified and current copy of his Power of Attorney.

ARTICLE 8

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 Form to be Used

8.11 Form of the contract to be used shall be Standard Form of Agreement Between Owner And Contractor, AIA Document A101.

8.2 Award

8.2.1 Before award of the contract, the successful bidder shall furnish to the Owner a certified copy of the minutes of the corporation or partnership meeting which authorized the party executing the bid to sign on behalf of the Contractor.

ARTICLE 9

COMPLETION TIME AND LIQUIDATED DAMAGES

9.1 The completion of the Contract must be within the time stated in this section, subject to such extensions as may be granted under Paragraph 8.3, "Delays and Extensions of Time" in the General Conditions and the Supplementary Conditions, or the Contractor will be subject to pay to the Owner Liquidated Damages in the amount as stated in this section.

If the Contractor shall neglect, fail, or refuse to complete the Work within the time specified for Substantial Completion in the Contract, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner, as liquidated damages and not as a penalty, the sum of $500.00 per day for each calendar day beyond the dates set forth in the Notice to Proceed Letter that the Contractor fails to achieve Substantial Completion for the Project. The said amount is fixed and agreed on by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the true value of the damages which the Owner will sustain by failure of the Contractor to complete the Work on time, such as loss of revenue, service charges, interest charges, delays caused to other construction activities of Owner by failure to perform this Contract, and other damages, some of which are indefinite and not susceptible of easy proof, said amount is agreed to be a reasonable estimate of the amount of damages which the Owner will sustain and said amount shall be deducted from any monies due or that may become due to the Contractor, and if said monies are insufficient to cover said damages, then the Contractor shall pay the amount of the difference.

The construction completion time is (240) Two Hundred Forty Days from the Notice to Proceed Letter.

ARTICLE 10

MANDATORY PRE-BID CONFERENCE

10.1 A pre-bid conference shall be held at the project site for general

contractors / prime bidders only as described in the Notice to Bidders. The purpose of the mandatory pre-bid conference is to familiarize Bidders with the requirements of the Project and the intent of the Contract Documents, and to receive comments and information from interested Bidders.

10.2 Any revision of the Bidding Documents made as a result of the mandatory pre-bid conference shall not be valid unless included in an Addendum.

BID FORM

TO: Citizens Progressive Bank
7712 Highway 165 South
Columbia, Louisiana 71418

A New Branch For:
Citizens Progressive Bank
5031 Cypress Street (Hwy 80)
West Monroe, Louisiana 71291

BID FOR: Citizens Progressive Bank

The undersigned bidder hereby declares and represents that she/he: a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by:
(TA2G) The Architecture Alliance Group, LLC and dated: September 20, 2024.

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

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

_____ Dollars ($ _____)

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

Alternate No. 1 Not Applicable *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

_____ Dollars ($ _____)

Alternate No. 2 Not Applicable *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

_____ Dollars ($ _____)

Alternate No. 3 Not Applicable *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

_____ Dollars ($_____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

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

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

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

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

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions modify, change, delete from or add to the General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

Articles, Paragraphs, Subparagraphs or Clauses modified or deleted have the same numerical designation as those occurring in the General Conditions.

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1. THE CONTRACT DOCUMENTS

In Subparagraph 1.1.1 delete the third sentence, and add the following sentence:

The Contract Documents shall include the Bid Documents as listed in the Instructions to Bidders and any modifications made thereto by addenda.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE [REFER TO *R.S. 38:2317*]

1.5.1 Delete the first sentence of the paragraph.

1.5.1 In the third sentence: delete the remainder after the word “publication”.

ARTICLE 2

OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 Delete this paragraph.

2.2.2 In the first sentence, delete: all before “…the Owner shall secure…”

ARTICLE 3

CONTRACTOR

3.4 LABOR AND MATERIALS

3.4.2 Delete this paragraph.

3.4.3 Delete this paragraph and substitute with the following:
Contractor and its employees, officers, agents, representatives, and Subcontractors shall conduct themselves in an appropriate and professional manner, in accordance with the Owner's requirements, at all times while working on the Project. Any such individual who behaves in an inappropriate manner or who engages in the use of inappropriate language or conduct while on Owner's property, as determined by the Owner, shall be removed from the Project at the Owner's request. Such individual shall not be permitted to return without the written permission of the Owner. The Owner shall not be responsible or liable to Contractor or any Subcontractor for any additional costs, expenses, losses, claims or damages incurred by Contractor or its Subcontractor as a result of the removal of an individual from the Owner's property pursuant to this paragraph. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS (R.S. 40:1724[A])

3.7.1 Delete Subparagraph 3.7.1

3.7.2 In paragraph 3.7.2, replace the word "public" with the word "Owner".

Delete Subparagraph 3.7.5 and substitute the following:

3.7.5 If, during the course of the Work, the Contractor discovers human remains, unmarked burial or archaeological sites, burial artifacts, or wetlands, which are not indicated in the Contract Documents, the Contractor shall follow all procedures mandated by State and Federal law, including but not limited to L.R.S. 8:671 et seq., R.S. 49:213.1 et seq., and Sections 401 & 404 of the Federal Clean Water Act. Request for adjustment of the Contract Sum and Contract Time arising from the existence of such remains or features shall be submitted in writing to the Owner pursuant to the Contract Documents.

3.8 ALLOWANCES

Delete Subparagraph 3.8.1, 3.8.2, and 3.8.3 in their entirety and add the following new Subparagraph 3.8.1:

3.8.1 Allowances shall not be made on any of the Work unless indicated on construction documents and specifications. See Section 01025 – Allowances.

3.9 SUPERINTENDENT

3.9.1 Add the following to the end of the paragraph: Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 Add the following: For projects with a contract sum greater than $1,000,000.00, the Contractor shall include with the schedule, for the Owner's and Architect's information, a network analysis to identify those tasks which are on the critical path, i.e. where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. A revised schedule shall be submitted with each Application and Certificate for Payment. No payment will be made until this schedule is received.

3.10.3 Delete the word "…general…" Add the following: If the Work is not on schedule, as determined by the Architect, and the Contractor fails to take action to bring the Work on schedule, then the Contractor shall be deemed in default under this Contract and the progress of the Work shall be deemed unsatisfactory. Such default may be considered grounds for termination by the Owner for cause in accordance with 14.2.

3.10.4 Add the following: Submittal by the contractor of a schedule or other documentation showing a completion date for his Work prior to the completion date stated in the contract shall not impose any obligation or responsibility on the Owner or Architect for the earlier completion date.

3.10.5 Add the following: In the event the Owner employs a commissioning consultant, the Contractor shall cooperate fully in the commissioning process and shall require all subcontractors and others under his control to cooperate. The purpose of such services shall be to ensure that all systems perform correctly and interactively according to the provisions of the Contract Documents.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following: This requirement is of the essence of the contract. The Architect shall determine the value of these documents and this amount shall not be approved for payment to the Contractor until all of the listed documents are delivered to the Architect in good order, completely marked with field changes and otherwise complete in all aspects.

ARTICLE 4

ARCHITECT

4.1 GENERAL

Delete Subparagraph 4.1.1 and substitute the following:

4.1.1 The term Architect, when used in the Contract Documents, shall mean the prime Designer (Architect, Engineer or Landscape Architect), or his authorized representative, lawfully licensed to practice architecture, engineering or landscape architecture in the State of Louisiana, identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number.

4.1.3 Delete the words: "as to whom the Contractor has no reasonable objection and"

4.2 ADMINISTRATION OF THE CONTRACT

4.2.1 In the first sentence, delete the phrase: "the date the Architect issues the final Certificate for Payment" and replace with the phrase "final payment is due, and with the Owner's concurrence, from time to time during the one year period for correction of Work described in Section 12.2."

4.2.2 In the first sentence, after the phrase: "become generally familiar with"; insert the following: "and to keep the Owner informed about."

In the first sentence, after the phrase "portion of the Work completed", insert the following: "to endeavor to guard the Owner against defects and deficiencies in the Work,"

4.2.10 Add the following sentence to the end of Subsection 4.2.10:

There will be no restriction on the Owner having a Representative.

4.2.11 Add the following sentence to the end of Subsection 4.2.11:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

4.2.14 Insert the following sentence between the second and third sentences of Subsection 4.2.14:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

ARTICLE 5

SUBCONTRACTORS

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

Delete Subparagraph 5.2.1, and substitute the following:

5.2.1 Unless otherwise required by the Contract Documents, the Contractor shall furnish at the Pre-Construction Conference, to the Owner and the Architect, in writing, the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. No Contractor payments shall be made until this information is received.

Delete Subparagraph 5.2.2 and substitute the following:

5.2.2 The Contractor shall be solely responsible for selection and performance of all subcontractors. The Contractor shall not be entitled to claims for additional time and/or an increase in the contract sum due to a problem with performance or non-performance of a subcontractor.

Delete Subparagraph 5.2.3 and 5.2.4 and add the following:

5.2.3 The contractor shall notify the Owner when a subcontractor is to be changed and substituted with another subcontractor.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Delete Subparagraphs 5.4.1, 5.4.2 and 5.4.3

ARTICLE 7

CHANGES IN THE WORK

7.1 GENERAL

Add the following paragraph:

7.1.4 As part of the pre-construction conference submittals, the contractor is to submit the following prior to the commencement of Work:

Fixed job site overhead cost itemized with documentation to support daily rates. Bond Premium Rate with supporting information from the General Contractor's carrier. Labor Burden by trade for both Subcontractors and General Contractor. Internal Rate Charges for all significant company owned equipment.

Failure to submit this information as part of the pre-construction submittals shall prohibit the Contractor from claiming these items as costs on any change order issued on the project.

7.2 CHANGE ORDERS

Delete Subparagraph clause 7.2.1, and substitute the following paragraphs:

7.2.1 A Change Order is a written order to the Contractor prepared by the Architect and signed by the Owner and the Architect, issued after 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. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time. Any reservation of rights, stipulation, or other modification made on the change order by the contractor will have no effect.

7.2.2 "Cost of the Work" for the purpose of Change Orders shall be costs required to be incurred in performance of the Work and paid by the Contractor and Subcontractors which shall consist of:

7.2.2.1 Wages paid direct labor personnel, delineating a labor burden markup for applicable payroll taxes, worker's compensation insurance, unemployment compensation, and social security taxes.

7.2.2.2 Cost of all materials and supplies, including the identification of each item and its cost including taxes.

7.2.2.3 Identify each necessary piece of machinery and equipment and its individual cost including taxes.

7.2.2.4 Increases in insurance premiums for those forms of insurance required by Article 11 of these Supplementary Conditions and only for those forms.

7.2.2.5 Bond costs.

Credit will not be required for Overhead and Profit.

7.2.3 Overhead and Profit - The Contractor and Subcontractor shall be due job-site and home office fixed overhead and profits on the Cost of the Work, but shall not exceed a total of 25% of the direct cost of any portion of Work:

The credit to the Owner resulting from a change in the Work shall be the sum of those items above, except credit will not be required for Overhead and Profit. Where a change results in both credits to the Owner and extras to the Contractor for related items, overhead and profit will only be computed on the net extra cost to the Contractor.

7.2.4 The cost to the Owner resulting from a change in the Work shall be the sum of: Cost of the Work (as defined at 7.2.2) and Overhead and Profit (as defined at 7.2.4), and shall be computed as follows:

7.2.4.1 When all of the Work is General Contract Work; 15% markup on the Cost of the Work.

7.2.4.2 When the Work is all Subcontract Work; 15% markup on the Cost of the Work for Subcontractor's Overhead and Profit, plus 10% markup on the Cost of the Work, not including the Subcontractor's Overhead and Profit markup, for General Contractor's Overhead and Profit.

7.2.4.3 When the Work is a combination of General Contract Work and Subcontract Work; that portion of the direct cost that is General Contract Work shall be computed per 7.2.4.1 and that portion of the direct cost that is Subcontract Work shall be computed per 7.2.4.2.

Premiums for the General Contractor's bond may be included, but after the markup is added to the Cost of the Work.

7.2.4.4 Subcontract cost shall consist of the items in 7.2.2 above plus Overhead and Profit as defined in 7.2.4.

7.2.5 Before a Change Order is prepared, the Contractor shall provide and deliver to the Architect the following information concerning the Cost of the Work, not subject to waiver, within a reasonable time after being notified to prepare said Change Order:

A detailed itemized list of labor, material and equipment costs for the General Contractor's Work including quantities and unit costs for each item of labor, material and equipment.

An itemized list of labor, material and equipment costs for each Subcontractor's and/or Sub-Subcontractor's Work including quantities and unit costs for each item of labor, material and equipment.

7.2.6 After a Change Order has been approved, no future requests for extensions of time or additional cost shall be considered for that Change Order.

7.2.7 The Contractor will be due extended fixed job-site overhead for time delays only when complete stoppage of Work occurs causing a contract completion extension, and the Contractor is unable to mitigate financial damages through replacement Work. The stoppage must be due to acts or omissions solely attributable to the Owner. In all cases the Contractor is to notify the Architect in writing as required by Article 15.1.2. Reasonable proof may be required by the architect that alternate Work could not be performed. Reasonable proof may be required by the Architect that the stoppage affected the Completion Date.

7.2.8 "Cost of the Work" whether General Contract cost or Subcontract cost shall not apply to the following:

Salaries or other compensation of the Contractor's personnel at the Contractor's principal office and branch offices.

Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work.

Overhead and general expenses of any kind or the cost of any item not specifically and expressly included above in Cost of the Work.

Cost of supervision not specifically required by the Change Order.

7.2.9 When applicable as provided by the Contract, the cost to Owner for Change Orders shall be determined by quantities and unit prices. The quantity of any item shall be as submitted by the Contractor and approved by the Architect. Unit prices shall cover cost of Material, Labor, Equipment, Overhead and Profit.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3 In the first sentence after following methods add: ", but not to exceed a specified amount."

7.3.7 Delete the following from .1 of the list: "fringe benefits required by agreement or custom,"

Delete the following from .4 of the list: "permit fees,"

Delete the following from .5 of the list: "and field office personnel"

7.3.9 Delete Subparagraph 7.3.9 and substitute the following:

Pending final determination of the total costs of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs.

ARTICLE 8

TIME

8.1 DEFINITIONS

Add the following:

8.1.5 The Contract Time shall not be changed by the submission of a schedule that shows an early completion date unless specifically authorized by change order.

8.2 PROGRESS AND COMPLETION

Add to Subparagraph 8.2.1 the following:

Completion of the Work must be within the Time for Completion stated in the Agreement, subject to such extensions as may be granted under Section 8.3. The

Contractor agrees to commence Work as described in the Written Notice to Proceed from the Owner and to substantially complete the project within the time stated in the Contract. The Owner will suffer financial loss if the project is not substantially complete in the time set forth in the Contract Documents. The Contractor and the Contractor's Surety shall be liable for and shall pay to the Owner the sum stated in the Contract Documents as fixed, agreed and liquidated damages for each consecutive calendar day (Saturdays, Sundays and holidays included) of delay until the Work is substantially complete. The Owner shall be entitled to the sum stated in the Contract Documents. Such Liquidated Damages shall be withheld by the Owner from the amounts due the Contractor for progress payments.

Delete Subparagraph 8.2.2

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 In the first sentence after the words Owner pending delete the words: "mediation and arbitration" and add the word: "litigation" and delete the last word: "determine" and add the following: "recommend, subject to Owner's approval of Change Order. If the claim is not made within the limits of Article 15, all right for future claims for that month are waived."

ARTICLE 9

PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Delete Subparagraph 9.2 and substitute the following:

9.2 At the Pre-Construction Conference, the Contractor shall submit to the Owner and the Architect a Schedule of Values prepared as follows:

9.2.1 The attached Schedule of Values Format shall be used. If applicable, the cost of Work for each section listed under each division, shall be given. The cost for each section shall include Labor, Materials, Overhead and Profit.

9.2.2 The Total of all items shall equal the Total Contract Sum. This schedule, when approved by the Architect, shall be used as a basis for the Contractor's Applications for Payment and it may be used for determining the cost of the Work in deductive change orders, when a specific item of Work listed on the Schedule of Values is to be removed. Once the Schedule of Values is submitted at the Pre-

Construction Conference, the schedule may not be modified without approval from the Owner and Architect.

9.3 APPLICATIONS FOR PAYMENT

Delete Subparagraph 9.3.1 and clause 9.3.1.1 and 9.3.1.2 and substitute the following:

9.3.1 Monthly, the Contractor shall submit to the Architect an Application & Certificate for Payment on the AIA Document G702-1992, accompanied by AIA Document G703-1992, and supported by any additional data substantiating the Contractor's right to payment as the Owner or the Architect may require. Application for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated into the Work and of materials, suitably stored, at the site as of the twenty-fifth day of the preceding month, less normal retainage as follows, per R.S. 38:2248:

9.3.1.1 Projects with Contract price up to $500,000.00 – 10% of the Contract price.

9.3.1.2 Projects with Contract price of $500,000.00, or more – 5% of the Contract price.

9.3.1.3 No payment will be made until the revised schedule required by Section 3.10.1 is received.

The normal retainage shall not be due the Contractor until after substantial completion and expiration of the forty-five day lien period and submission to the Architect of a clear lien certificate, consent of surety and invoice for retainage.

Delete Subparagraph 9.3.2 and substitute the following:

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. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, including applicable insurance.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Subparagraph 9.5.1.7: Delete the word "repeated".

Delete Subparagraph 9.5.3

9.6 PROGRESS PAYMENTS

Delete Subparagraph 9.6.1 and substitute the following:

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment within twenty days.

9.6.2 Delete the phrase: "no later than seven days" from the first sentence.

After the end of the second sentence, add the following:

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

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

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

9.7 FAILURE OF PAYMENT

Delete Subparagraph 9.7

9.8 SUBSTANTIAL COMPLETION: Delete this section and substitute the following:

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The Architect shall determine if the project is substantially complete in accordance with this Subparagraph not the Fire Marshal Granted Occupancy.

9.8.2 When the Contractor considers that the Work 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 is substantially complete. A prerequisite to the Work being considered as substantially complete is the Contractor has executed the entire school restroom renovations. The entire school will be required to be complete for final substantial. Prior to inspection by the Architect, the Contractor shall notify the Architect that the project is ready for inspection by the State Fire Marshal's office or roofing manufacturer inspector. 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 for its intended use, the Contractor shall, before the Work can be considered as Substantially Complete, 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 Architect determines that the project is Substantially Complete, he shall prepare a punch list of exceptions and the dollar value related thereto. The monetary value assigned to this list will be the sum of the cost estimate for each particular item of Work the Architect develops based on the mobilization, labor, material and equipment costs of correcting the item and shall be retained from the monies owed the contractor, above and beyond the standard lien retainage. The cost of these items shall be prepared in the same format as the schedule of values. At the end of the 45 day lien period payment shall be approved for all punch list items completed up to that time. After that payment, none of the remaining funds shall be due the contractor until all punch list items are completed and are accepted by the Architect. If the dollar value of the punch list exceeds the amount of funds, less the retainage amount, in the remaining balance of the Contract, then the Project shall not be considered as substantially complete. If funds remaining are less than that required to complete the Work, the Contractor shall pay the difference.

9.8.5 When the preparation of the punch list is complete the Architect shall prepare a Letter for Recommendation of Acceptance incorporating the punch list and submit it to the Owner. Upon approval of the Letter for Recommendation of Acceptance by Owner, the Architect will issue a Substantial Completion of the Building Contract which shall establish the Date of Substantial Completion. The Contractor will record the Substantial Completion with the Clerk of Court in the Parish in which the Work has been performed. If the Substantial Completion has

not been recorded seven (7) days after issuance, the Owner may record the Acceptance at the Contractor's expense. All additive change orders must be processed before issuance of the Substantial Completion. The Owner will not be responsible for payment for any Work associated with change orders that is not incorporated into the contract at the time of the Substantial Completion.

9.8.6 Warranties required by the Contract Documents shall commence on the date of the Substantial Completion of the Work unless otherwise agreed to in writing by the Owner and Contractor. Unless otherwise agreed to in writing by the Owner and Contractor, security, maintenance, heat, utilities, damage to the Work not covered by the punch list and insurance shall become the Owner's responsibility on the Date of Substantial Completion.

9.8.7 If all punch list items have not been completed by the end of the thirty (30) day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not completed the punch list, through no fault of the Architect or Owner, the Owner may, at his option, contract to have the balance of the Work completed and pay for such Work with the unpaid funds remaining in the Contract sum. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future state contracts. If the surety fails to complete the punch list within the stipulated time period, the Owner may not accept bonds submitted, in the future, by the surety.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 Delete paragraph and substitute the following:

Partial Occupancy is that stage in the progress of the Work when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the designated portion of the Work for its intended use. The Owner may occupy or use any substantially completed portion of the Work so designated by separate agreement with the Contractor and authorized by public authorities having jurisdiction over the Work. Such occupancy or use may commence provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, 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 the designated portion substantially complete the Contract shall prepare and submit a list to the Architect as provided under Subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonable withheld.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 After the first sentence, add the following:

If the Architect does not find the Work acceptable under the Contract Documents, the Architect shall make one additional inspection; if the Work is still not acceptable, the Architect, and each of the Architect's principal consultants, shall be paid $175.00/hour for their time at the project site, for each additional inspection, to be withheld from the unpaid funds remaining in the Contract sum. The payment shall be made by the Owner and deducted from the construction contract funds.

9.10.4 Replace with the following:

The making of final payment shall not constitute a waiver of claims by the Owner for the following:

9.10.4.1 Claims, security interests or encumbrances arising out of the Contract and unsettled;

9.10.4.2 Failure of the Work to comply with the requirements of the Contract Documents irrespective of when such failure is discovered; or

9.10.4.3 Terms of special warranties required by the Contract Documents.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.2 In the first sentence, between the words: "bearing on and safety", add the words: "the health and,"

10.3 HAZARDOUS MATERIALS

10.3.1 In the first sentence after (PCB) add: "or lead"

10.3.2 After the first sentence, delete all remaining sentences.

Add at the end: "The Contract time shall be extended appropriately."

10.4 EMERGENCIES

Delete Subparagraph 10.4 and substitute the following:

10.4 In an emergency affecting the safety of persons or property, the Contractor shall notify the Owner and Architect immediately of the emergency, simultaneously acting at his discretion to prevent damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency Work shall be determined as provided in Article 15 and Article 7.

ARTICLE 11

INSURANCE AND BONDS

Delete all of Paragraphs 11.1, 11.2 and 11.3 and substitute the following:

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

The following insurance policies shall name the owner as an additional insured.

11.2 MINIMUM SCOPE AND LIMITS OF INSURANCE

11.2.1 Worker's Compensation

Worker's Compensation insurance shall be in compliance with the Worker's Compensation law of the State of Louisiana. Employers Liability is included with a minimum limit of $500,000 per accident/per disease/per employee. If Work is to be performed over water and involves maritime exposure, applicable LHWCA, Jones Act or other maritime law coverage shall be included and the Employers Liability limit increased to a minimum of $1,000,000. A.M. Best's A+ insurance company rating requirement may be waived for Worker's compensation coverage only.

11.2.2 Commercial General Liability

Commercial General Liability insurance, including Personal and Advertising Injury Liability and Products and Completed Operations Liability, shall have a minimum limit per occurrence based on the project value. The Insurance Services Office (ISO) Commercial General Liability occurrence coverage form CG 00 01 (current

form approved for use in Louisiana), or equivalent, is to be used in the policy. Claims-made form is unacceptable.

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

COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

Type of Construction	Projects up to $1,000,000	Projects over $1,000,000 up to $10,000,000	Projects over $10,000,000
New Buildings:			
Each Occurrence Minimum Limit	$1,000,000	$2,000,000	$4,000,000
Per Project Aggregate	$2,000,000	$4,000,000	$8,000,000
Renovations:	The building(s) value for the Project provided by Owner.		
Each Occurrence Minimum Limit	$1,000,000**	$2,000,000**	$4,000,000**
Per Project Aggregate	2 times per occur limit**	2 times per occur limit**	2 times per occur limit**

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

11.2.3 Automobile Liability

Automobile Liability Insurance shall have a minimum combined single limit per occurrence of $1,000,000. ISO form number CA 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. This insurance shall

include third-party bodily injury and property damage liability for owned, hired and non-owned automobiles.

11.2.4 Excess Umbrella

Excess Umbrella Insurance may be used to meet the minimum requirements for General Liability and Automobile Liability only.

11.2.5 Builder's Risk

The General Contractor is to provide Builders' Risk Insurance to protect the Owner, Contractor, and their Subcontractors as their interest may appear. The policy is subject to $1000 deductible per claim for loss or damage which deductible will be paid by the Contractor.

Builder's Risk Insurance shall be in an amount equal to the greater of the fully-completed project value or the amount of the construction contract including any amendments and shall be upon the entire Work included in the contract. The policy shall provide coverage equivalent to the ISO form number CP 10 20, Broad Form Causes of Loss (extended, if necessary, to include the perils of wind, earthquake, collapse, vandalism/malicious mischief, and theft, including theft of materials whether or not attached to any structure). The policy must include architects' and engineers' fees necessary to provide plans, specifications and supervision of Work for the repair and/or replacement of property damage caused by a covered peril, not to exceed 10% of the cost of the repair and/or replacement.

Provide a copy of this policy to Owner for their files.

11.3.1.3 Builder's Risk

The policy must include an endorsement providing the following:
In the event of a disagreement regarding a loss covered by this policy which may also be covered by an Owner' self-insurance or commercial property policy, Contractor and its insurer agree to follow the following procedure to establish coverage and/or the amount of loss:

Any party to a loss may make written demand for an appraisal of the matter in disagreement. Within 20 days of receipt of written demand, the Contractor's insurer and either ORM or its commercial insurance company shall each select a competent and impartial appraiser and notify the other of the appraiser selected. The two appraisers will select a competent and impartial umpire. The appraisers will then identify the policy or policies under which the loss is insured and, if necessary, state separately the value of the property and the amount of the loss

that must be borne by each policy. If the two appraisers fail to agree, they shall submit their differences to the umpire. A written decision by any two shall determine the policy or policies and the amount of the loss. Each insurance company agrees that the decision of the appraisers and the umpire if involved will be binding and final and that neither party will resort to litigation. Each of the two parties shall pay its chosen appraiser and bear the cost of the umpire equally.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

At the end of the paragraph, add the following sentences: "If the Contractor fails to correct Work identified as defective within a thirty (30) day period, through no fault of the Designer, the Owner may hold the Contractor in default. If the Owner finds the Contractor in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the nonconforming Work, through no fault of the Architect or Owner, the Owner may contract to have nonconforming Work corrected and hold the Surety and Contractor responsible for the cost, including architectural fees and other indirect costs. If the Surety fails to correct the Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may elect not to accept bonds submitted in the future by the Surety. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future state contracts.

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 At the end of the paragraph delete the last sentence and add the following sentences: If the Contractor fails to correct nonconforming Work within a thirty (30) day period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the nonconforming Work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming Work corrected and hold the Surety responsible for the cost including architects fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4. If the Surety fails to correct the nonconforming Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may not accept bonds submitted, in the future, by the Surety.

12.2.2.1 At the end of the paragraph delete the last sentence and add the following sentences: If the Contractor fails to correct Work covered by warranties within a thirty (30) day period, through no fault of the Architect or Owner, the Owner

may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the warranty Work, through no fault of the Architect or Owner, the Owner may contract to have the warranty Work corrected and hold the Surety responsible for the cost including architects fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4. If the Surety fails to correct the warranty Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may not accept bonds submitted, in the future, by the Surety.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Delete all after the word “located”.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 In the second sentence, delete “Except as … 13.2.2”

Delete paragraph 13.2.2

13.4 RIGHTS AND REMEDIES

Add the following clause 13.4.3

13.4.3 The Fourth Judicial Court in and for the Parish of Ouachita, State of Louisiana shall have sole jurisdiction and venue in any action brought under this contract.

13.5 TESTS AND INSPECTIONS

In Subparagraph 13.5.1, delete the second sentence and substitute the following:

The Contractor shall make arrangements for such tests, inspections and approvals with the Testing Laboratory provided by the Contractor, and the Contractor shall bear all related costs of tests, inspections and approvals.

Delete the last sentence of Subparagraph 13.5.1

13.6 INTEREST

Delete Paragraph 13.6

13.7 TIME LIMITS ON CLAIMS

Delete Paragraph 13.7 (See L.R.S. 38:2189).

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

Delete clause 14.1.1.4

In Subparagraph 14.1.3, after the word “profit” add the following: “for Work completed prior to stoppage”.

14.2 TERMINATION BY THE OWNER FOR CAUSE

Add the following clause:

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

14.2.3 Add the following sentence:

Termination by the Owner shall not suspend assessment of liquidated damages against the Surety.

14.2.5 Add the following Subparagraph:

If an agreed sum of liquidated damages has been established, termination by the Owner under this Article will not relieve the Contractor and/or surety of his obligations under the liquidated damages provisions and the Contractor and/or surety shall be liable to the Owner for per diem liquidated damages.

ARTICLE 15

CLAIMS AND DISPUTES

15.1 CLAIMS

In the first sentence of Subparagraph 15.1.1, after the word “money”, add the phrase: “extension of time,”

15.1.2 Add the following to the end of the paragraph: A Reservation of Rights and similar stipulations shall not be recognized under this contract as having any effect. A party must make a claim as defined herein within the time limits provided.

15.1.3 In the second sentence of the Subparagraph, delete “the decisions of the Initial Decision Maker” and replace with: “his/her decision”.

Delete Paragraph 15.1.5.2 and substitute the following:

If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction. An increase in the contract time due to weather shall not be cause for an increase in the contract sum. At the end of each month, the Contractor shall make one Claim for any adverse weather days occurring within the month. The Claim must be accompanied by sufficient documentation evidencing the adverse days and the impact on construction. Failure to make such Claim within twenty-one (21) days from the last day of the month shall prohibit any future claims for adverse days for that month.

15.1.5.3 Add the following Subparagraph:

The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January	11 days	July	6 days
February	10 days	August	5 days
March	8 days	September	8 days
April	7 days	October	3 days
May	5 days	November	5 days
June	6 days	December	10 days

The Contractor shall ask for total adverse weather days. The Contractor must ask the same month of adverse weather days with his application of payment. Any other days will not be accepted. The Contractor’s request shall be considered only for days over the allowable number of days stated above.

Note: Contract is on a calendar day basis.

15.2 INITIAL DECISION

15.2.1 In the second sentence, delete the word "will" and replace with: "shall always".

In the second sentence, delete the phrase: "unless otherwise indicated in the Agreement."

In the third sentence, delete the word "mediation" and replace with: "litigation".

In the third sentence, delete: "unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered."

15.2.5 In the middle of the first sentence, delete all after the phrase: "rejecting the Claim".

In the second sentence, delete the phrase: "and the Architect, if the Architect is not serving as the Initial Decision Maker."

In the third sentence, delete all after: "binding on the parties" and add the following: "except that the Owner may reject the solution or suggest a compromise or both."

15.2.6 Delete Paragraph.

Delete Subparagraph 15.2.6.1

15.3 MEDIATION

Delete Article 15.3

15.4 ARBITRATION

Delete Article 15.4

15.5 EQUAL OPPORTUNITY (Add this Section)

15.5.1 The Contractor and all Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contract shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, 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 setting forth the policies of nondiscrimination.

15.5.2 The Contractor and Subcontractor shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

BID BOND
FOR

Date: _____

KNOW ALL MEN BY THESE PRESENTS:

That_____of_____, as Principal, and _____, as Surety, are held and firmly bound unto the _____ (Obligee), in the full and just sum of five (5%) percent of the total amount of this bid, including all alternates, lawful money of the United States, for payment of which sum, will and truly be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally firmly by these presents.

Surety represents that it is listed on the current U. S. Department of the Treasury Financial Management Service list of approved bonding companies as approved for an amount equal to or greater that the amount for which it obligates itself in this instrument or that it is a Louisiana domiciled insurance company with at least an A - rating in the latest printing of the A. M. Best's Key Rating Guide. If surety qualifies by virtue of its Best's listing, the Bond amount may not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide.

Surety further represents that it is licensed to do business in the State of Louisiana and that this Bond is signed by surety's agent or attorney-in-fact. This Bid Bond is accompanied by appropriate power of attorney.

THE CONDITION OF THIS OBLIGATION IS SUCH that, whereas said Principal is herewith submitting its proposal to the Obligee on a Contract for:

_____

NOW, THEREFORE, if the said Contract be awarded to the Principal and the Principal shall, within such time as may be specified, enter into the Contract in writing and give a good and sufficient bond to secure the performance of the terms and conditions of the Contract with surety acceptable to the Obligee, then this obligation shall be void; otherwise this obligation shall become due and payable.

_____ _____

PRINCIPAL (BIDDER) SURETY

BY: _____ BY:_____

AUTHORIZED OFFICER-OWNER-PARTNER AGENT OR ATTORNEY-IN-FACT(SEAL)

GEOTECHNICAL EXPLORATION

PROPOSED CITIZENS PROGRESSIVE BANK
WEST MONROE, LOUISIANA
FILE NO. G23-09-159

Prepared for

GLOBAL LABORATORIES
105 PARKWEST DRIVE
WEST MONROE, LOUISIANA 71291

GOLDMAN GEOTECHNICAL CONSULTING, LLC

Taylor M. Goldman, PE
Member/Principal
(870) 904-2778

GOLDMAN
GEOTECHNICAL CONSULTING
LLC

3841 Industrial Circle, Suite 100
Bossier City, LA 71112
goldmangeotech@gmail.com
goldmangeotech.com

October 16, 2023

Mr. Jimmy Kent
Global Laboratories
105 Parkwest Drive
West Monroe, Louisiana 71291

RE: Geotechnical Exploration
Proposed Citizens Progressive Bank
West Monroe, Louisiana
File No. G23-09-159

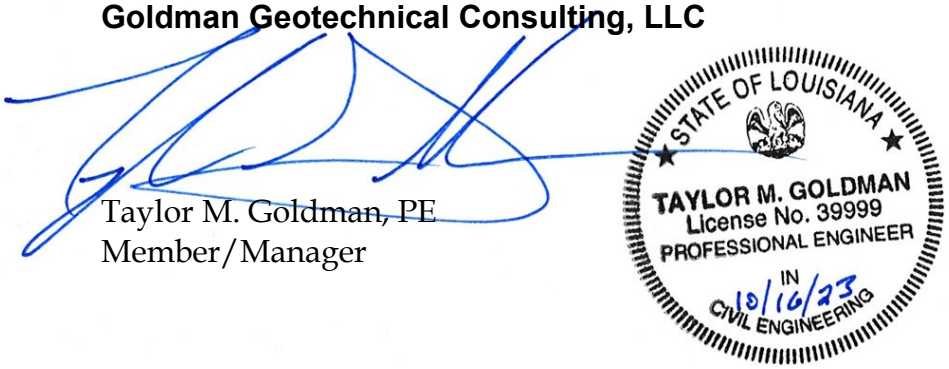
Dear Mr. Kent:

This office is pleased to transmit our geotechnical engineering services report for the above referenced project. The attached report presents the results of site investigations, laboratory testing, and engineering analysis and recommendations.

We appreciate the opportunity to provide our services to you and look forward to serving as your geotechnical consultant throughout this project. Please do not hesitate to contact this office if you have any questions regarding the information presented or if we may be of further service.

Sincerely,

Goldman Geotechnical Consulting, LLC



Taylor M. Goldman, PE
Member/Manager

GEOTECHNICAL EXPLORATION
PROPOSED CITIZENS PROGRESSIVE BANK
WEST MONROE, LOUISIANA

PROJECT DESCRIPTION

This report presents the results of the geotechnical exploration performed for the proposed Citizens Progressive Bank branch in West Monroe, Louisiana. The construction will take place on a vacant lot essentially located on the southern side of Cypress Street between and existing Wendy's restaurant and O'Reilly Auto Parts store. The approximate location of the proposed construction site and the boring locations are indicated on the attached Boring Location Diagram. The project will consist of construction of single-story bank structure and associated parking and drive areas. The building is anticipated to be constructed with either wood and/or light metal frame, masonry veneer and/or stucco for exterior walls, and a concrete slab on grade. Anticipated wall loads are anticipated to be on the order of one (1) kip to two (2) kips per linear foot with possible maximum isolated column loads on the order of forty-five (45) kips.

Existing and final elevations of the construction area were not provided prior to this investigation. However, based on visual observations of site topography and preliminary design information provided to this office, it is anticipated that the final floor elevation of the proposed structure will likely be established through fill operations on the order of one (1) foot to two (2) feet, following stripping, to facilitate proper site drainage. The proposed pavement subgrade will likely be established at

or near the existing grades at the time of the field operations, possibly requiring minor fill placement following stripping.

GENERAL

The study was authorized by Global Laboratories via email on September 25, 2023. The purpose of the investigation was to evaluate the general subsurface conditions and develop recommendations for the design of the foundation system(s) of the proposed structure, pavement sections, and subgrade preparation. The study included drilling a sample boring, performing laboratory testing, and engineering analysis of the subsurface conditions. The field and laboratory investigations included in this report have been conducted in accordance with applicable standards and procedures set forth in ASTM Standards.

FIELD OPERATIONS

The subsurface conditions were evaluated by advancing three (3) intermittent sample borings on August 25, 2021. The number and depth of the borings performed were specified by the design professional. The boring locations were selected by the design professional and staked in the field by representatives of Goldman Geotechnical Consulting, LLC. An illustration of the approximate location of the boring is provided on the attached Boring Location Diagram. Descriptive terms and symbols used on the log are in accordance with the Unified Soil Classification System. Surface elevations at the borehole locations were not supplied prior to field operations.

A truck mounted auger drill rig was used to advance the test borings. Intermittent undisturbed samples were obtained in the following manner. Standard penetration tests were performed in accordance with ASTM procedures. This test is conducted by recording the number of blows required for a one hundred forty (140) pound hammer falling thirty (30) inches to drive a split spoon sampler eighteen (18) inches into the substrata. Depths at which split spoon samples were taken are indicated by two (2) crossed lines in the “Samples” column on the Log of Boring. The number of blows required to drive the sampler for each 6-inch increment were recorded. The penetration resistance is the number of blows required to drive the split spoon sampler the final twelve (12) inches of penetration. Information related to the penetration resistance is presented under the “Field Data” head of the Log of Boring. All samples were extruded in the field, sealed to maintain in-situ conditions, and packaged for transport to the laboratory for additional testing.

Water observations were recorded during the drilling operations and again in the open boreholes upon completion of the field services to evaluate ground water conditions. All borings were backfilled at completion of the field operations.

LABORATORY TESTING

Upon return to the laboratory all samples were visually logged in accordance with the Unified Soils Classification System. Selected samples were subjected to standard laboratory tests under the supervision of a geotechnical engineer to verify classification and to determine pertinent engineering properties of the substrata.

The results of laboratory testing and soil classifications are tabulated on the attached Log of Boring. Samples obtained during our field studies and not consumed by laboratory testing procedures will be retained for a period of thirty (30) days. Arrangements for storage beyond that period must be made in writing with this office.

SUBSURFACE CONDITIONS

The subsurface stratigraphy of the site is comprised of four (4) generalized strata. The surficial stratum encountered in boring B-1 and B-3 is comprised of firm tan silty sand with clay seams and partings and trace gravel to approximately one and a half (1.5) to two and a half (2.5) feet depth. The silty sand exhibits no plasticity. The surficial stratum encountered in boring B-2, as well as the stratum underlying the silty sand in borings B-1 and B-3, is comprised of very loose to firm tan, gray, and dark gray silty, clayey sand and clayey sand to approximately eight (8) to eighteen (18) feet depth. The clayey sand soils exhibit low plasticity, very low to moderate shear strength, and high to moderate compressibility. The silty, clayey sand in boring B-3 is underlain by very stiff gray and tan sandy lean clay to approximately thirteen and a half (13.5) feet depth. The sandy lean clay soils exhibit low plasticity, moderately high shear strength, and moderate to low compressibility. The lower stratum encountered in all borings is comprised of firm to loose tan and gray silty sand to the twenty (20) feet termination depth. The silty sand exhibits no plasticity.

The subsurface descriptions provided in this section are of a generalized nature to highlight the major stratification features and material characteristics. For a detailed description of the subsoil stratification refer to the soil profile located on the attached Logs of Boring.

Subsurface water was encountered in all borings and depths between thirteen (13) and seventeen (17) feet during drilling operations. The water levels were measured at depths between approximately eight (8) and twelve (12) feet upon completion of the field operations. The borehole walls collapsed at between twelve (12) and fifteen (15) feet depths upon the completion of the drilling operations. Based upon site topography, subsurface stratigraphy, and anticipated construction techniques required for this project, groundwater is not anticipated to present any significant problems during the construction phase of the project. However, the depth of perched water and shallow groundwater is influenced by seasonal moisture variations. Consequently, the depth to shallow subsurface water should be verified prior to the start of construction of the project.

SEISMIC DESIGN CONSIDERATIONS

The International Building Code, 2021 edition requires the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site. As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the

site based upon the characteristic of the subsurface profile within the upper 100 feet of the ground surface.

To define the Site Class for this project we have interpreted the results of the test borings drilled within the project site and estimated appropriate soil properties below the base of the borings to a depth of 100 feet as permitted by the code. The estimated soil properties were based upon our experience with subsurface conditions in the general site area. Based upon this evaluation, the subsurface conditions within the site are consistent with the characteristics of a Site Class "D" (stiff soil profile) as defined in Table 1613.5.2 of the building code.

ANALYSIS AND RECOMMENDATIONS

Shallow Foundation System

Based on the site topography and visual observations, it is anticipated that site grading will likely include placement of one (1) foot to two (2) feet of select fill material, following stripping, to establish finish floor elevation. With the analysis of the field and laboratory program and potential site grading, a shallow foundation system can be utilized for support of the proposed structure. Either continuous footings and/or isolated spread footings appear feasible at this site. The base of the footings should be placed in properly prepared in-situ subgrade or select fill material as per the Site Preparation section of this report at a depth of approximately eighteen (18) inches to two (2) feet below the final adjacent grade.

It must be noted that the in-situ, surficial silty, clayey sand to silty sand soils have a silt fraction and plasticity that may cause the materials to be classified as moisture sensitive. This classification of soil is subject to extreme changes in strength with varying moisture conditions. Saturation of silty soils generally results in a “quick” or “pumping” condition upon application of vibratory or dynamic loads typically associated with construction equipment. Consequently, if the in-situ soils begin to “pump” or yield, it generally becomes necessary to undercut the saturated soil and replace it with select fill.

An allowable bearing pressure of 1800 psf can be used for the design of continuous footings placed in the previously described strata. The bearing value contains a factor of safety on the order of two (2). A minimum footing width of eighteen (18) inches should be maintained for all steel reinforced continuous footings as protection against isolated shear failure or isolated consolidation of the previously constructed select fill.

Isolated spread footings may be considered for support of interior columns or other areas of concentrated load. The base of the spread footings should be placed in the previously described strata. An allowable pressure of 2000 psf can be used to proportion all spread footings. The bearing value contains a factor of safety on the order of two (2). All spread footings should be designed with a minimum base width of twenty-four (24) inches.

Lateral resistance to sliding will be provided by sliding resistance and passive earth pressure on the edge of the foundation elements. Resistance to sliding may be evaluated using an ultimate friction factor (μ) value of 0.35 for concrete on medium stiff and stiff sandy lean clay to clayey sand, similar to the recommended select fill material and in-situ clayey sand. The ultimate passive pressure for the native subgrade will be on the order of 270 pounds per square feet per foot of depth. An appropriate factor of safety should be applied to the above values to obtain the allowable lateral resistance of the foundation system.

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. The concrete should be placed as soon as possible after excavation to minimize bearing soil disturbance. Should the soils at the bearing elevation become excessively dry, disturbed, or saturated, the affected soils should be removed prior to placement of concrete.

Alternate Foundation Systems

If foundation loads become too significant or construction techniques become too stringent for shallow foundations to be feasible, the foundation loads may be supported by a deep foundation system. Due to the low cohesion and potential sloughing of the in-situ soils, as well as the relatively shallow groundwater elevation, the typical deep foundation system of drilled and cast-in-place concrete piers may not be feasible. Consequently, it is recommended that helical foundation piers be considered. Helical piers can be relatively easily installed with limited access, and

the amount of spoils produced during the installation process should be minimal. Additionally, the presence of shallow groundwater is not a limitation concerning the installation of the piers.

The helical pier foundation system should be designed by a professional engineer experienced in helical pier design and installed by an experienced contractor. Helical piers manufactured from galvanized steel should be utilized to prevent corrosion. With helical pier foundations elements, lateral resistance is generally achieved through depth and multiple piers. Alternatively, greater lateral and/or uplift resistance, as well as vertical load resistance, may be provided by utilizing grout around each pile. The design depths shall be provided by the design professional to achieve the necessary load resistance capabilities. We recommend that load tests be performed on helical piers of equivalent size and embedment as the designed production element to verify or determine the single pile load capacity.

Alternatively, provided in the following table are allowable loads for various diameter drilled and cast-in-place concrete piers for deep foundation consideration, if necessary. The depths provided are the minimum shaft lengths below the ground elevation at the time of the geotechnical investigation.

Diameter (inches)	Depth (feet)	Allowable Loads (kips)
12	10	6
18	10	11
24	10	16
30	10	22
36	10	28
42	10	35
48	10	43

The bearing values provided contain a factor of safety on the order of two (2). Casing of the shafts should not be required to install the piers to the depths indicated, especially if installed during a dry period of the climatic cycle. However, the depth of shallow groundwater varies throughout the year for multiple reasons. Consequently, it is recommended that the depth of the groundwater be established prior to installation commencing. All pier excavations should be essentially dry and clean prior to concrete placement. Concrete should not be placed by dropping from the concrete truck chute into pier excavations with more than about three (3) inches of water present in the bottom. Limited seepage into drilled pier excavations can probably be controlled by close coordination of drilling, cleanup and concrete placement. However, if pier excavations cannot be dewatered through pumping or other means, underwater concrete placement techniques may be warranted. Consequently, it is recommended that test shafts be drilled and installed prior to

construction to establish an installation procedure. All test shafts should be of a similar size to the production piers.

Slab-on-Grade

Based on the anticipated site grading, subgrade information, and site preparation efforts provided for the foundation alternatives, it is recommended that a uniform thickness of select fill be placed beneath the top of subgrade elevation to minimize the potential for differential movement beneath the slab. It is anticipated that a minimum of one (1) foot of select fill material will be placed as per the Site Preparation section of this report. The limits of the select fill placement and subrade preparation should extend a minimum of five (5) feet beyond the perimeter of the structure. The recommended select fill material possesses a low susceptibility to shrink and swell with variations in moisture content. Subsequently, the slab for the proposed structure can be placed directly on the properly prepared subgrade. Slabs, which are placed at grade in select fill material, should be stiffened and reinforced to tolerate potential differential movements between the periphery and the interior portions of the slabs associated with consolidation of select fill material or isolated undiscovered soft strata.

Care should be taken to shape the site such that water does not pond around the structure during construction. When the structure is complete, the ground surface should slope away from the structure and all roof runoff should be collected in a

gutter system and piped away from the structure, preferably onto paved areas or into subsurface drainage systems before discharging.

SITE PREPARATION

Site preparation should begin with the stripping of all organic laden soils and the removal of any undiscovered debris. A stripping depth on the order of six (6) to eight (8) inches below existing grades is expected. Additional excavation and backfill may be necessary in isolated areas of the site due to soft strata, foreign debris laden soils, or the relocation of subsurface utilities. Once all deleterious matter has been removed, provide drainage of the exposed subgrade by sloping grades and ditching.

Following stripping and cutting and prior to fill placement, the exposed surface of areas to receive fill material or directly support the foundation elements should be scarified to a minimum depth of twelve (12) inches and compacted to a minimum of ninety-five (95) percent of the maximum dry density determined by ASTM D-698 with the moisture content adjusted to within two (2) percent below to two (2) percent above optimum. Succeeding moisture and density controlling, the subgrade should be proof-rolled with a loaded tandem-wheel dump truck or equivalent equipment. Proof-rolling should be observed by a representative of a qualified testing laboratory to verify stable subgrade conditions. All soft or loose soils encountered within the construction areas should be undercut, stabilized, processed, and recompacted or excavated and replaced with select fill, whichever is appropriate.

It must be noted that the in-situ, surficial silty, clayey sand soils have a silt fraction and plasticity that may cause the materials to be classified as moisture sensitive. This classification of soil is subject to extreme changes in strength with varying moisture conditions. Saturation of silty soils generally results in a “quick” or “pumping” condition upon application of vibratory or dynamic loads typically associated with construction equipment. Consequently, if the in-situ soils begin to “pump” or yield, it generally becomes necessary to undercut the saturated soil and replace it with select fill.

Place select fill in thin, essentially horizontal layers not exceeding eight (8) inches in loose thickness and compact to a minimum of ninety-five (95) percent of the maximum density established by ASTM D-698 and the moisture content maintained to within two (2) percent below to three (3) percent above optimum moisture content. All select fill should be sandy clay or clayey sand possessing a liquid limit no greater than thirty-five (35), a plasticity index ranging between five (5) and eighteen (18), and not greater than sixty-five (65) percent passing the No. 200 mesh sieve. Soils possessing a plasticity index less than five (5) or a percent passing the No. 200 sieve greater than sixty-five (65) should not be utilized as structural fill at this site without prior approval by the design professional. Any on-site materials that are to be excavated and exhibit the above recommend select fill characteristics may be stockpiled and utilized.

PAVEMENT SECTIONS

The design of pavement sections for this site is based upon the upper twelve (12) inches of subgrade meeting the requirement of compaction presented in the Site Preparation section of this report and anticipated traffic loading. Onsite, surficial soils and any possible select fill material will have Unified Soil Classifications of SM, SC-SM, CL, or SC. The in-situ soils and/or select fill should, if properly prepared, yield a CBR value on the order of eight (8) and a corresponding modulus of subgrade reaction (k) of 115 pci. The select fill material and/or subgrade preparation should extend a minimum of twelve (12) inches beyond the edge of the pavement.

It is strongly recommended that rigid pavement sections be given the highest priority for this site. For the benefit of comparing the first costs of construction, alternative flexible pavement sections have been provided in the following sub-section of this report. However, it is entirely likely that Portland cement concrete sections will cost less over the life of the pavement than equivalent asphaltic concrete sections.

Automobile Traffic Only

6 inches Portland Cement Concrete
over
12 inches Density Controlled In-situ Subgrade **or** Select Fill Material

Channelized Heavy Truck Traffic

8 inches Portland Cement Concrete
over
4 inches Crushed Stone Base Material
over
12 inches Density Controlled In-situ Subgrade **or** Select Fill Material

Portland cement concrete, with air entrainment admixture, should possess a minimum compressive strength of 3500 pounds per square inch at twenty-eight (28) days and should have weakened planes installed at maximum spacing of fifteen (15) feet.

The following flexible pavement sections are provided for this project under the circumstances that the subgrade soils will be prepared as previously discussed in beginning of this section of the report:

Automobile Parking and Access Drive Areas

2 inches Hot Mixed Asphaltic Concrete
over
6 inches Aggregate Base Material
over
12 inches Density Controlled In-situ Subgrade **or** Select Fill Material

Channelized Heavy Truck Traffic

4 inches Hot Mixed Asphaltic Concrete
over
8 inches Aggregate Base Material
over
12 inches Density Controlled In-situ Subgrade **or** Select Fill Material

Hot Mixed Asphaltic Concrete shall consist of Asphaltic concrete as defined by section 502 of The Louisiana Standard of Specifications for Roads and Bridges issued by the Louisiana Department of Transportation and Development. For thickness requirements greater than two (2) inches, the total section may consist of a minimum of two (2) inches of wearing course over the remaining thickness of base course asphaltic concrete.

SUBSURFACE CORROSIVENESS

Resistivity tests were completed on the site to test for corrosiveness of the in-situ soils for underground utility piping. The resistivity measurements were performed with pin spacing equal to five (5) feet and ten (10) feet, which correlates to resistivity measurements at depths of five (5) feet and ten (10) feet below the ground surface, relatively. The field resistivity testing resulted in values considered to be moderately corrosive to corrosive with a range of 9,553 to 6,139 ohm-cm. Numerous factors within the soil strata can result in significant variations in soil resistivity. Major factors influencing soil resistivity include, but are not limited to, soil classification, moisture content, soil temperature variations with depth, and presences of metals. The soil resistivity ranges in conjunction with the corrosivity rating are provided in the following table:

RESISTIVITY (OHM-CM)	CORROSITIVTY RATING
> 20,000	Essentially Non-Corrosive
10,000 to 20,000	Mildly Corrosive
5,000 to 10,000	Moderately Corrosive
3,000 to 5,000	Corrosive
1,000 to 3,000	Highly Corrosive
< 1,000	Extremely Corrosive

Consequently, the soils encountered on this site, based on the on-site testing, are classified as moderately corrosive.

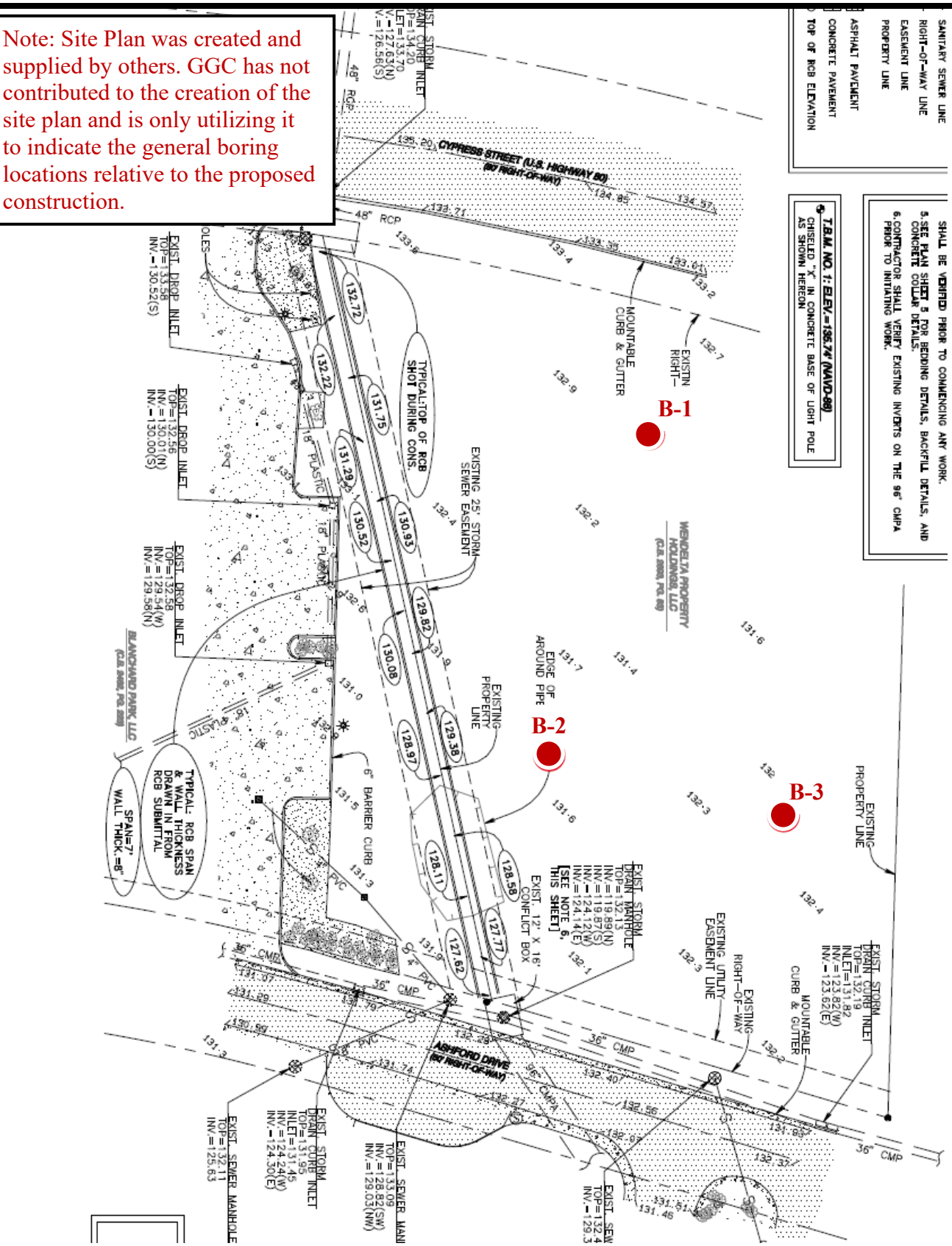
LIMITATIONS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from any other information discussed in the report. This report does not reflect any variations which may occur across the site. The nature and extent of such variations may not become evident until construction. If variations appear evident it will be necessary to reevaluate the recommendations of this report.

It is recommended the Geotechnical Engineer be given the opportunity to review the plans and specifications so comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. Sound engineering judgement must be followed when applying the recommendations to designs, plans, and also during the construction monitoring.

This report has been prepared for the exclusive use of our client for specific applications to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. In the event any changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report are verified in writing by the Geotechnical Engineer.

Note: Site Plan was created and supplied by others. GGC has not contributed to the creation of the site plan and is only utilizing it to indicate the general boring locations relative to the proposed construction.



GOLDMAN GEOTECHNICAL CONSULTING LLC

BORING LOCATION DIAGRAM
PROPOSED CITIZENS PROGRESSIVE BANK
WEST MONROE, LOUISIANA

October 10, 2023

Project: G23-09-159

LOG OF BORING B-1

Goldman Geotechnical Consulting, LLC
3841 Industrial Circle, Suite 100
Bossier City, Louisiana 71112
Telephone: (318) 459-6696

CLIENT: Global Laboratories
PROJECT: Citizens Progressive Bank
LOCATION: West Monroe, Louisiana
NUMBER: G23-09-159
DATE(S) DRILLED: 10/3/23

DRILLING METHOD(S):
Continuous Flight Auger

GROUNDWATER INFORMATION:
Groundwater encountered at 13 ft during drilling operations.
Water level recorded at 12 ft during drilling operations.
Borehole walls collpased at 15 ft.

SURFACE ELEVATION: Unknown

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (LL)	ATTERBERG LIMITS: PLASTIC LIMIT (PL)	ATTERBERG LIMITS: PLASTICITY INDEX (PI)	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
			N = 17	10	NP	NP	NP					39	Firm tan silty sand (SM) with clay partings and seams
			N = 4	14	16	10	6						Loose gray silty, clayey sand (SC-SM)
	5		N = 7	15	17	11	6					49	-- Gray and tan below 5 ft
			N = 9	16									-- Firm below 8 ft
	10												
			N = 12	26	NP	NP	NP					15	Firm tan and gray silty sand (SM)
	15												
			N = 9	36	NP	NP	NP						
	20												Boring Terminated 20 ft

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:

LOG OF BORING B-2

Goldman Geotechnical Consulting, LLC
3841 Industrial Circle, Suite 100
Bossier City, Louisiana 71112
Telephone: (318) 459-6696

CLIENT: Global Laboratories
PROJECT: Citizens Progressive Bank
LOCATION: West Monroe, Louisiana
NUMBER: G23-09-159
DATE(S) DRILLED: 10/3/23

DRILLING METHOD(S):
Continuous Flight Auger

GROUNDWATER INFORMATION:
Groundwater encountered at 17 ft during drilling operations.
Water level recorded at 12 ft during drilling operations.
Borehole walls collpased at 15 ft.

SURFACE ELEVATION: Unknown

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (LL)	ATTERBERG LIMITS: PLASTIC LIMIT (PL)	ATTERBERG LIMITS: PLASTICITY INDEX (PI)	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
			N = 16	11	25	14	11						Firm tan and gray clayey sand (SC)
			N = 4	13								47	-- Loose below 2 ft
	5		N = 2	24	16	11	5					43	Very loose gray and dark gray silty, clayey sand (SC-SM)
			N = 4	17								32	Loose gray and dark gray clayey sand (SC)
	10												
			N = 6	25	24	14	10					41	-- Tan and gray below 13 ft
	15												
			N = 8	34	NP	NP	NP					18	Loose tan and gray silty sand (SM)
	20												Boring Terminated 20 ft

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:

LOG OF BORING B-3

Goldman Geotechnical Consulting, LLC
3841 Industrial Circle, Suite 100
Bossier City, Louisiana 71112
Telephone: (318) 459-6696

CLIENT: Global Laboratories
PROJECT: Citizens Progressive Bank
LOCATION: West Monroe, Louisiana
NUMBER: G23-09-159
DATE(S) DRILLED: 10/3/23

DRILLING METHOD(S):
Continuous Flight Auger

GROUNDWATER INFORMATION:
Groundwater encountered at 13 ft during drilling operations.
Water level recorded at 8 ft during drilling operations.
Borehole walls collpased at 12 ft.

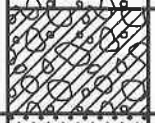
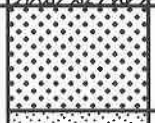
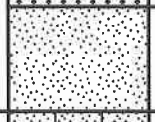
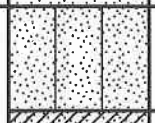
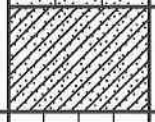
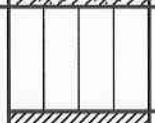
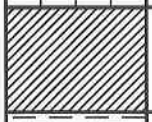
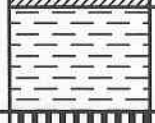
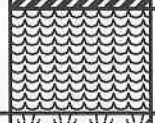
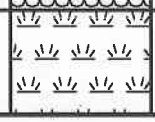
SURFACE ELEVATION: Unknown

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: BLOWS R: % RQD: %	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (LL)	ATTERBERG LIMITS: PLASTIC LIMIT (PL)	ATTERBERG LIMITS: PLASTICITY INDEX (PI)	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
			N = 16	11	NP	NP	NP					38	Firm tan sitly sand (SM) with clay seams and trace gravel
			N = 6	13								46	Loose gray and tan sand silty, clayey sand (SC-SM)
	5		N = 17	13	17	10	7						-- Firm below 5 ft
			N = 25	19	29	16	13					59	Very stiff gray and tan sandy lean clay s(CL)
	10												
			N = 9	32	NP	NP	NP					14	Firm tan and gray silty sand (SM)
	15												-- Loose below 18 ft
			N = 8	33	NP	NP	NP						
	20												Boring Terminated 20 ft

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - TXDOT CONE PENETRATION RESISTANCE
R - ROCK CORE RECOVERY
RQD - ROCK QUALITY DESIGNATION

REMARKS:

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SECTION 01010 - SUMMARY OF WORK

PART ONE - GENERAL

WORK COVERED BY CONTRACT DOCUMENTS

The work of this Contract comprises the furnishing of all labor, materials, services, equipment, appliances, taxes and insurance required in conjunction with, or properly incidental to, the construction:

A NEW BRANCH FOR:
CITIZENS PROGRESSIVE BANK
5031 CYPRESS STREET (HIGHWAY 80)
WEST MONROE, LOUISIANA 71291

Including but not limited to:

Temporary construction, furnishing and connections of utilities, construction of pavements, sidewalks, site drainage, general construction, electrical and mechanical, all in strict accordance with Construction Documents prepared by TA²G (The Architecture Alliance Group), 2002 Auburn Avenue, Monroe, Louisiana 71201.

The project consists of a general contractor constructing a new golf complex.

The awarded General Contractor will coordinate all his work with the Site General Contractor schedule and attend all project meetings that are scheduled.

CONTRACT

One (1) Contract will be awarded.

The General Contractor will provide the building permit, inspection fees, etc. with the Ouachita Parish requirements.

CONTRACTORS USE OF PREMISES

Use of site is exclusive and complete for execution of work as shown and designated on drawings and specified.

The awarded general contractor will work along with another Site General Contractor that will be providing the other construction items for their project. The awarded GC will coordinate all their work with the Site General Contractor. The awarded GC will attend project meetings with Owner, Architect, and Site General Contractor to discuss and

coordinate their work.

The Contractor shall confine his operations and be responsible for all activities within these areas described above.

The Contractor will be required to go outside the Property Lines for work connected with the entrances, exits, and utilities.

Take precautions to protect all existing items shown on the drawings.
Do not unreasonably encumber site with materials and equipment.

The Contractor shall take full responsibility for protection and safekeeping of his materials and equipment stored at site.

The General Contractor shall have the full authority and right to fence, or otherwise secure around areas of new construction for purposes of providing the necessary safety and material security during the entire contract period. Access to aforementioned fenced area shall be by the Contractor's authorized personnel only and the Contractor shall have the right to deny access by unauthorized personnel and to provide watchman for enforcement of same.

PART TWO - PRODUCTS

MATERIALS AND PRODUCTS

All materials and products shall be new and free from defects. Only the materials and products specified in the contract Documents, Addenda or Change Order will be accepted on the job. SEE SECTION 01600 - MATERIALS AND EQUIPMENT.

PART THREE - EXECUTION

COMPLETION TIME

Contractor shall furnish sufficient forces, construction plant and equipment, and work such hours, including weekends and night shifts as may be necessary to insure completion of work in accordance with Construction Schedule. The project construction time is (240) Two Hundred Forty Days as described in the Instruction to Bidders.

Liquidated damages clause in Instruction to Bidders.

PROJECT COORDINATION

Contractor shall staff job with Project Manager qualified to perform construction scheduling, shop drawings, orderings materials and their timely delivery. Coordinate

Construction Operations included in various sections of the specifications to assure efficient and orderly installation of each part of the work. Coordinate Construction Operations included under different sections that depend on each other for proper installation, connection, and operation. Project manager assigned to the job shall not be disassociated with the project without the consent of Owner and Architect.

Contractor shall submit and furnish an updated Construction Schedule at each monthly meeting. Contractor's Application for Payment shall be withheld until contractor has submitted an updated schedule.

CONSTRUCTION SUPERVISION

Contractor shall staff job on-site with full time job Superintendent qualified to perform all job site coordination. The Job Superintendent shall remain at the job site the full duration of the project until all Punch List items are complete. Job Site Superintendent shall not be removed from the site without the consent of the Owner and Architect.

EXECUTION

All work and inspections of fire alarm, fire suppression, automatic sprinkler and fire extinguishing systems or portable fire extinguishers shall be performed by a State of Louisiana certified agent. (if applicable)

The contractor shall notify the District Office for inspection of all completed fire and/or smoke barrier walls before any construction is installed that would conceal such construction and prevent a proper inspection. Access to random selected areas may be required by the inspector at time of final inspection if this notification is not given.

Provide detailed instructive cut sheets of the fire penetration sealing system used to the inspector at time of inspection. Random selective sampling by the Contractor will be observed by the inspector.

TYPE OF WORKMANSHIP

Contractor shall perform work with craftsman knowledgeable and capable of delivering a quality built structure. All surfaces shall be erected true, straight, plumb and level. Any surface found to be unsuitable shall be corrected at Contractor's expense.

END OF SECTION 01010

SECTION 01025 – ALLOWANCES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements governing Contract allowances.

1 Allowances as set forth in the Specifications are to be used as compensation for items as set forth in this Section. The amounts listed in the schedule and/or Specifications are to be included in the base bid and shall be listed separately in the Schedule of Values and Application for Payment.

1.02 RELATED SECTIONS

A. A201 – General Conditions

1.03 ALLOWANCES

A. Use the allowances only as authorized for construction purposes and only by an approved schedule of values form that indicate the amounts to be charged to the respective allowance amount.

B. The allowance amount includes the Contractor and Subcontractor material, shipping, delivery, installation, profit, overhead and markup.

1.04 ALLOWANCE DISBURSEMENT

A. CONTRACTOR shall submit a request for allowance disbursement on a pay request line items schedule of values. Include all substantiating and/or required data along with the request.

PART 2 - PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALLOWANCES

1. Allow $25,000 for unforeseen items the owner my add to the project. This should be included in the base bid.

END OF SECTION 01025

SECTION 01200 - PROJECT MEETINGS

PART ONE - GENERAL

RELATED WORK SPECIFIED ELSEWHERE

Bidding requirements, general conditions of the contract, supplementary conditions, pertinent portions of sections in Division 1 of the Project Specifications and the drawings shall apply to the work of this Section.

WORK INCLUDED

Attendance by General Contractor and Subcontractors all listed conferences and meeting schedule by the Owner or Architect and all other concerned parties to coordinate work efforts and/or circumvent or solve any potential problems.

PRE-CONSTRUCTION CONFERENCE

After notification that the Contract has been executed, the Architect shall arrange with the Owner, School Staff and Contractor and conduct a pre-construction conference to be held at the project site. The Contractor shall be responsible to see that his principal subcontractors are in attendance and shall furnish to the Architect, Owner and User Agency:

1. The Schedule of Values
2. List of subcontractors and material suppliers
3. The construction schedule.

MONTHLY MEETING

The Contractor, principal subcontractors, and material suppliers shall meet with representatives of the Owner, and the Architect at the building site or at some other designated meeting place on campus monthly or as necessary to maintain an optimum degree of communication between all parties. Contractor shall submit and furnish an updated Construction Schedule at each monthly meeting. Contractor's Application for Payment shall be withheld until contractor has submitted updated schedule.

PART TWO – PRODUCTS; N/A

PART THREE – EXECUTION; N/A

END OF SECTION 01200

SECTION 01340 - SUBMITTALS & SHOP DRAWINGS

PART ONE - GENERAL

RELATED WORK SPECIFIED ELSEWHERE

Bidding and/or Negotiation Requirements, General Conditions of the Contract, Supplementary Conditions, pertinent portions of sections in Division 1 of the Project Specifications and the Drawings shall apply to the Work of this Section.

WORK INCLUDED

Submit Subcontractor Information Data, Shop Drawings, Product Data, Samples and Schedule of Values as required by Contract Documents in accordance with requirements specified herein.

SUBCONTRACTOR INFORMATION DATA

SCOPE: Furnish "Subcontractor Information Data" found under General Contractor Documents, as printed in these Specifications, within 48 hours of Bid Date.

SHOP DRAWINGS

Where Shop Drawings are required for submittal under individual sections, drawings shall be submitted and presented in clear and thorough manner as follows:

A. Drawings: Provide Shop Drawings with all information required in accordance with submittal requirements found under individual sections of Project Manual Specifications.
B. Details: Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
C. Required Number: One (1) set in reproducible form (sepias) and four (4) sets of prints.

Architect will mark any corrections and comments on reproducible sepia and return mark up sepia and one (1) copy of prints to the contractors.

If directed, submit one (1) set of correct Shop Drawings in reproducible form (sepias).

Note: Begin no fabrication or work which requires submittals until the architect checks submittals and shop drawings for compliance with design requirements.

PRODUCT DATA

Where Product Data, brochures, descriptive literature, color charts, etc. are required for submittal under individual sections, submit as follows:

A. Preparation:
   1. Clearly mark each copy to identify pertinent products or models.
   2. Show performance characteristics and capacities.
   3. Show dimensions and clearances required.
   4. Show wiring or piping diagrams and controls.

B. Required Number: Submit six (6) copies.

SAMPLES

Where samples are required for submittal under individual sections, submit as follows:

A. Office Samples: Samples shall be of sufficient size and quantity to clearly illustrate.
   1. Functional characteristics of product, with integrally related parts and attachment devices.
   2. Full range of color, texture and pattern.

B. Required Number: Submit three (3) copies.

SUBMISSION REQUIREMENTS

Make Submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in Work.

Submittals shall contain the following information:

A. Date of submission and dates of any previous submissions.
B. Project Title and Architect's Commission Number.
C. Names of:
   1. Contractor
   2. Supplier
   3. Manufacturer
D. Identification of product by Project Manual Specification section number.
E. Field dimensions, clearly identified as such.
F. Applicable standards, such as A.S.T.M.
G. Identification of deviations from Contract Documents.
H. Contractor’s stamped, signed and dated as to his review and approval.
   (NOTE: Architect shall not review shop drawings until Contractor has made his review and approval.)

RESUBMISSION REQUIREMENTS

Make any corrections or changes in submittals required by Architect and resubmit until approved. Resubmission requirements are same as notes above for submissions with following addition requirements:

A. Shop Drawings and Product Data:
   1. Revise initial changes or data, and resubmit.
   2. Indicate any revisions on resubmittals.
   3. Indicate any changes which have been made other than those requested by Architect.

B. Samples: Submit new samples as required for initial submittal.

ARCHITECT DUTIES

Architect shall check submittals and shop drawings for "compliance with design requirements" only.

Architect to review submittals with reasonable promptness and in accord with schedule. Architect to approval stamp and initial or signature, and indicate approval of submittal or requirements for resubmittal. Architect to return to Contractor for distribution, or for resubmission.

PART TWO - PRODUCTS

NOT APPLICABLE

PART THREE - EXECUTION

NOT APPLICABLE

END OF SECTION 01340

SECTION 01400 - TESTING LABORATORY SERVICE

PART ONE - GENERAL

SELECTION & PAYMENT

The Owner will engage and pay for the services of an independent testing laboratory to perform inspection and tests of materials and construction as defined in the General Conditions.

TEST METHODS

Test and inspections shall be conducted in accordance with the latest standards of ASTM or other recognized authorities.

TEST REPORTS

The laboratory shall promptly submit written reports of each test and inspection made to the Owner, Architect, Engineer, Contractor and to such other such parties the Owner may specify.

EVENT OF LABORATORY TEST AND INSPECTIONS

The Architect will recommend to the Owner the type and number of tests to be performed on the project. The Contractor shall be advised of the number and type of test to be performed by the Testing laboratory. The Contractor is responsible for supplying concrete that meets the concrete design mixes specified under Division 3 of the Contract Document.

COOPERATION OF CONTRACTOR

The Contractor shall cooperate and:

A. Make available, without cost, samples of all materials to be tested in accordance with applicable standard specifications.

B. Furnish such nominal labor and sheltered working space as is necessary to obtain samples at the project.

C. Advise the laboratory of the identity of materials sources and instruct the suppliers to allow test or inspections by the laboratory.

D. Notify the laboratory sufficiently in advance of operations to allow for completion of initial tests and assignment of inspection personnel.

E. Notify the laboratory sufficiently in advance of cancellation of required testing operations. The Contractor shall be responsible to the laboratory for changes due to failure to notify if requirements for testing are cancelled.

PART TWO - PRODUCTS

NOT APPLICABLE

PART THREE - EXECUTION

NOT APPLICABLE

SECTION 01500 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

PART ONE - GENERAL

RELATED WORK SPECIFIED ELSEWHERE

Bidding requirements, General Conditions of the Contract, Supplementary Conditions, pertinent portions of sections in Division 1 of the Project Specifications and the drawings shall apply to the work of this section.

WORK INCLUDED

Contractor shall visit the site and ascertain for themselves the existing conditions affecting the work.

PERSONAL INVESTIGATIONS

All Bidders on portions of this work must inform themselves fully as to the location of the improvements, location and availability of utilities, local ordinances, the use of streets, maintenance of lights, payment of fees and permits, and all other factors entering into the work so that they may have a comprehensive conception of all the conditions to be encountered, as lack of information will not relieve the Bidder of the responsibility that he assumes.

EXISTING UTILITIES AND SUB-SURFACE ITEMS

The drawings indicate all known existing above ground and sub-surface items and utilities in the vicinity of new construction. Other unknown items and utilities may be existing in the vicinity of construction, and neither the Owner or the Architect assume any responsibility for the failure to show such items or utilities, or to have shown the known items in their exact location. If these existing items or utilities interfere with the new construction, the Contractor shall at his option, either (1) abandon such existing items and install new utilities outside the building construction, or (2) replace existing utilities with new material acceptable to the Architect. Payment for this work shall be based on unit prices, if they are included in the bidding documents; if not included, payment shall be in accordance with paragraph 12.2.1 of the General Conditions of the Contract.

ARCHITECTURAL OBSERVATION

The work shall be carried on under the observation of the Architect and/or his authorized representative. No concrete shall be placed unless the architect or his representative is present. In general, no work shall be covered until it has been inspected and approved by the Architect And/or his representative.

INTERPRETATION OF DRAWINGS & SPECIFICATIONS

The Architect, as the originator of the Drawings and Specifications, shall be deemed the sole judge of the Drawings and Specifications, and the intent thereof; and his decision shall be final and binding on all parties concerned.

CORRELATION & INTENT

If there should be any discrepancy between scale and dimensions, figured dimensions shall over-ride scale dimensions. Although plans are drawn to scale, as indicated, and dimensions are given, in the case of remodeling or reconstruction work, or in fitting in the case of remodeling or reconstruction work, or in fitting work to measurements of existing conditions, the Contractor shall work to measurements of existing construction.

PERMITS AND LICENSES

The Contractor shall procure all necessary permits and licenses and shall observe and abide by all applicable laws, ordinances, and regulations by the Local and State governments and by the Federal government.

CODES

Whenever a specific code is referred to herein, then this code is hereby made a part of the Contract, inasmuch as any portion is applicable to this project, except as same may be herein modified.

PROJECT LIMIT LINES

Contract Limit Lines are indicated, in general, on the drawings. All work under this contract is limited within the general area as bounded by said Contract Limit Lines, Contractor shall not be required to go beyond these specific Contract Limit Lines unless the Designer determines that such action is required to complete the intent of the project documents, or access or connection to required utilities are required.

PROJECT SITE

The area under this Contract, and assigned to the Contractor for his operations, is indicated on the drawings by "Contract Limit Lines" and is hereby designated as the Project Site. The Contractor shall assume responsibility for the security and protection of these areas during the entire construction Contract period inclusive of protection of all materials, property, vegetation, and utilities within the Project Site.

Any material stored shall be stored within the "Contract Limit Lines", unless other areas are authorized for storage of the materials by Architect or Owner.

SPOIL MATERIALS

Spoil materials at project site free of debris and roots may be utilized for required backfill material. Location for deposition materials within Project Limit Lines shall be directed by the Architect. Contractor shall be responsible to remove from site and legally dispose of all debris and excess excavated material not required for fill.

DEBRIS

Contractor shall not be allowed to accumulate debris on site for an extended period of time. Contractor shall be responsible to remove from site and legally dispose of all accumulated debris daily.

ACCESS TO AREAS

Contractor shall have free and permissible vehicular and pedestrian access to project site at all times. See Construction Schedule Section 01010 Summary of Work.

SITE SECURITY

The General Contractor shall have the full authority and right to fence, or otherwise secure the around areas of new construction for purposes of providing the necessary safety and material security during the entire contract period. Access to aforementioned fenced area shall be by the Contractor's authorized personal only and the Contractor shall have the right to deny access by unauthorized personnel and to provide watchman for enforcement of same.

SEPARATE CONTRACTS

The Owner may award separate contracts on this project for equipment, furniture, etc. This Work as indicated and specified shall be included under a single base bid, and alternates as indicated.

CONSTRUCTION SCHEDULE

A twenty-four hour notice shall be given to the Owner prior to temporarily disconnecting any major utilities which would affect normal operation of any other structures on the campus.
See Section 01010 - Summary of Work - for required Construction Schedule.

TEMPORARY CONTROLS & PERMITS

SCOPE

Unless otherwise called for herein, all temporary facilities for construction purposes called for in the documents as well as other related temporary work necessary and required to complete the project shall be provided by contractor and they shall be removed by him at the completion of the project. Obtain and pay for all permits and licenses required by City, Parish, State and Federal authorities.

TEMPORARY SCAFFOLDS, STAGING AND SAFETY DEVICES

Provide, erect, maintain, and remove when no longer required; all scaffolding, staging, platforms, temporary runways, guards, bracing, shoring, sheet piling, lights, warning signs, fences, barricades, railings, covers, drop cloths, etc., as required by local, state, and federal codes, or laws, for the protection of property, workmen, and the public, both on and adjacent to the construction site. The construction, inspection and maintenance of the above items shall comply with all safety codes and regulations as applicable to the project. All temporary provisions shall be the responsibility of the General Contractor. Adequate provision shall be made to minimize the amount of noise and dust annoyance. Any damage caused by his operations shall be the responsibility of the General Contractor. Provide personal safety equipment for authorized visitors. Provide and maintain warning lights and signs as necessary to prevent damage or injury. Keep warning lights burning from dusk to dawn. Maintain all items in good, safe condition throughout the duration of the project.

Contractors bidding on this job are advised that the provisions of 40 U.S.C. 333, as implemented by the Regulations of the Secretary of Labor, 36, F.R. 7339-7410 apply to this Contract and the successful Bidder will be required to comply therewith.

TEMPORARY LIGHTING

Make the necessary arrangements and provide all temporary lighting required during the entire construction period.

Provide a minimum of three (3) watts per square foot of temporary lighting in each room to insure proper application and inspection of finishes. Lighting in each space shall be arranged to provide reasonably uniform overall lighting.

Permanent wiring and installed fixtures existing and/or new, may be used, provided they are adequately protected, cleaned and re-lamped with new lamps at time of inspection for substantial completion. All temporary lighting shall be kept in safe and operating condition throughout construction period.

COLD WEATHER PROTECTION AND TEMPORARY HEAT

Provide for all cold weather protection, temporary heat and fuel as necessary to carry on

the work expeditiously during inclement weather to protect all work and materials against injury from dampness and cold, to dry out the building and to provide suitable working conditions for the installation and curing of materials, all until acceptance by the Owner.

TEMPORARY TOILET FACILITIES

Contractor shall provide and maintain an adequate number of temporary prefabricated chemical type toilets with proper enclosures as necessary for his use during construction. Keep such facilities in a sanitary condition, comply with all local and state health requirements and sanitary regulations, and remove same upon completion of the project, leaving the premises clean and sanitary.

TEMPORARY ELECTRICITY

The Owner will provide electricity during the construction period on the schools existing system. All connections are by General Contractor.

All necessary facilities, such as wiring, panel boards, outlets, switches, lamps, fuses, controls and accessories shall be provided by the Contractor. The materials used for temporary service shall not be used in the permanent system unless specific approval is given by the Architect. Contractor shall remove all temporary connections and items upon completion of project.

TEMPORARY WATER AND GAS

Contractor shall provide all required connections and materials, and shall remove same upon completion of the project.

SECURITY

Contractor shall be responsible for the guarding of the premises against theft, vandalism and unauthorized use and trespassing from beginning of construction until final acceptance of the project by the Owner.

PUMPING AND DRAINING

Keep working and storage areas free from water that could cause damage or that could interfere with progress of work.

Slope ground to drain surface water away from excavations and structures.
Pump or drain to designated points. Distribute discharge to prevent excessive erosion.
Replace eroded materials.

TEMPORARY FIELD OFFICE AND SHEDS

At all times, provide and maintain a watertight office for the use of the Architect, Contractor and Sub-Contractors. Provide temperature control during working hours as required by the season (air conditioning or heat). Office shall contain minimum of 200 sq. ft. of floor space with adequate lighting, file racks for storage of drawings, countertop (minimum 6'-0" x 2'-6"), storage shelves, two (2) stools and telephone. Provide lock with two (2) keys for Architect's use. Provide all necessary sheds with raised flooring for storage of equipment and materials. This office shall accommodate monthly meetings.

CLEANING

Remove temporary work when need for its use has passed.

Clean spaces that were occupied by temporary work. Remove debris, rubbish and excess materials from site. Burning or burying not permitted on site.

Repair damages caused by installation or use of temporary facilities.

END OF SECTION 01500

SECTION 01600 - MATERIALS AND EQUIPMENT

RELATED WORK SPECIFIED ELSEWHERE

Bidding Requirements, General Conditions of the Contract, Supplementary Conditions, pertinent portions of sections in Division 1 of the Project Specifications and the Drawings shall apply to the Work of this Section.

WORK INCLUDED

Provide materials and equipment that are indicated and/or specified to be incorporated into Work as follows:

A. Conform to applicable specifications and standards.
B. Comply with size, make, type, and quality indicated and/or specified or as specifically approved in writing by Architect.
C. Manufactured and Fabricated Products:
    1. Design, fabricate and assemble in accordance with best engineering and shop practices.
    2 Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
    3. Two or more items of same kind shall be identical and by same manufacturer.
    4. Products shall be suitable for service conditions
    5. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved by Architect in Writing.
D. Do not use materials or equipment for any purpose other than that for which it is designed or is specified.

MANUFACTURER'S SPECIFICATIONS & PRODUCT NUMBERS

The Contractor is hereby advised of the following information extracted from Act 803, of the 1980 Regular Louisiana Legislative Session:

1. The name of certain brands, makes, manufacturers and definite specifications are included in the Contract Documents to denote the quality standard of the article desired and does not restrict bidders to the specific brand, make, manufacturer, or specification named. It is set forth to convey to prospective bidders the general style, type, character, and quality of article desired.

2. When in these Contract Documents a particular brand, make of material, device, or equipment is shown or specified, such brand, make of material, device or

equipment shall be regarded merely as a standard

3. If a potential supplier desires to submit for prior approval a particular product other than a product specified in the Contract Documents, he shall do so no later than seven (7) calendar days prior to the opening of bids. Within three (3) days, exclusive of holidays and week-ends, after such submission, the Architect shall furnish to both the public entity and the potential supplier written approval or denial of the product submitted.

MANUFACTURER'S INSTRUCTIONS

When Contract Documents require that installation of various products used in Project be installed in compliance with manufacturer's printed instructions, Contractor shall execute that portion of the Work as follows:

A. Obtain and distribute copies of such instructions to parties involved in each products installation including two (2) copies to Architect. Maintain one set of complete instructions at jobsite during installation. Include one complete set of instructions with Project Record Documents
B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformance with specified requirements.
    1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
    2. Do not proceed with Work without clear instructions.
    3. Perform Work in accordance with manufacturers instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.
C. Manufacturer's printed installation instructions which, when specified and approved by Architect, shall become basis for inspecting and accepting or rejecting actual installation methods used on Work.

TRANSPORTATION AND HANDLING

Arrange deliveries of products in accordance with construction schedules, coordinate with Work and condition at Project site as follows:

A. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
B. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and that they are undamaged.
C. Provide equipment and personnel to handle product by methods to prevent soiling or damage to products or packaging.

STORAGE AND PROTECTION

Store products in accordance with manufacturer's instructions, with seals and labels intact and legible, as indicated in various other sections and as follows:

A. Store products subject to damage by elements in weathertight enclosures.
B. Main temperature and humidity within ranges covered by manufacturer's instructions.
C. Provide exterior storage as follows:
    1. Store fabricated products above ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
    2. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter.
D. Arrange storage in manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and that products are free from damage or deterioration.

Provide substantial covering as necessary to protect installed products from damage from traffic and/or subsequent construction operations. Remove when no longer needed.

GUARANTEE

The Contractor shall be required to guarantee all materials and workmanship furnished by himself or his subcontractors against any defects that may develop or be discovered within a period of one (1) year from the date of Final Acceptance.

Contractor shall promptly make any such corrections when called upon to do so by the Architect and/or Owner. Should the Contractor fail to so remedy any such defects within a reasonable length of time, the Owner shall have the right to make these corrections and charge same to the Contractor, and the Contractor by signing the Contract acknowledges that such charges are just, due and payable.

END OF SECTION 01600

SECTION 01700- CONTRACT CLOSEOUT

GENERAL

Comply with requirements in Divisions 1 - 16 and the various Technical Sections of the Specifications for Administrative Procedures in closing out the Work.

RELATED REQUIREMENTS IN OTHER PARTS OF THE PROJECT MANUAL

Fiscal provisions, legal submittals and additional administrative requirements.

Closeout submittals required of various trades: The respective sections of Specifications.

FINAL CLEANING

Employ skilled personnel, or professional cleaners, for final cleaning.

Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior finished surfaces including plumbing and electrical fixtures and mechanical equipment; polish surfaces so designated to shine finish.

Wash and shine glazing and mirrors.

Polish glossy surfaces to a clear shine.

Ventilating Systems: Clean permanent filters and replace disposable filters if units were operated during construction. Clean ducts, blowers and coils if units were operated without filters during construction.

Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

SUBSTANTIAL COMPLETION

When Contractor considers the Work is substantially complete, he shall submit to Architect:

1. A written notice that the work, or designated portion thereof, is substantially complete.
2. A list of items to be completed or corrected.

Within a reasonable time after receipt of such notice, Architect will make an inspection to determine the status of completion.

When Architect concurs that the Work is substantially complete, he will:

A. Prepare a Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect, with dollar value retainage for each work item.
B. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.
C. The Owner will supply a “beneficial occupy form” if required.

Owner may occupy the Project or designated portion of Project, under provisions stated in Beneficial Occupancy Form.

FINAL INSPECTION

When the Architect finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

CONTRACTOR'S CLOSEOUT SUBMITTALS TO ARCHITECT

PROJECT RECORD DOCUMENTS:

Refer to the General Conditions and Supplementary Conditions.

Contractor shall furnish to Architect one set of Record Documents including one set of construction drawings marked up to show "as built" conditions, incorporating all changes authorized during construction. (Architect shall delineate these changes to present reproducible documents to the Owner)

OPERATING & MAINTENANCE DATA, INSTRUCTIONS TO OWNER'S PERSONNEL:

Refer to Mechanical and Electrical and other applicable sections of the Project Manual.

Prior to Substantial Completion instruct Owner in the operation of all systems and equipment in accordance with manufacturer's recommendations and applicable sections of the Project Manual. Operating and maintenance manual shall constitute the basis for instruction.

SPARE PARTS & MAINTENANCE MATERIALS:

Refer to applicable sections of the Project Manual.

REQUIRED TESTS OF REGULATORY AGENCIES:

Submit certificate indicating that all required tests (water, etc.) of regulatory agencies have

been complied with.

WARRANTIES & BONDS:

Furnish warranties and bonds specified in the various sections of the Specifications. Time of warranties to begin on date of Substantial Completion.

KEYS AND KEYING SCHEDULE:

Refer to Section 08710.

EVIDENCE OF PAYMENT AND RELEASE OF LIENS:

Certificate by Clerk of Court. Refer to Supplementary Conditions.

PART TWO - PRODUCTS

NOT APPLICABLE

PART THREE - EXECUTION

NOT APPLICABLE

END OF SECTION 01700

SECTION 01740 – WARRANTIES AND BONDS

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

General closeout requirements are included in Section "Project Closeout."

Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Divisions-2 through
-16.

Certifications and other commitments arid agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

WARRANTY REQUIREMENTS

Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service.

Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, or shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, r remedies.

Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

The Owner reserves the right to refuse to accept Work for the reject where a. special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

SUBMITTALS

Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's certificate of Substantial Completion designates a commencement ate for warranties other than the date of Substantial Completion or the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

> When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.

When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

> Refer to individual Sections of Divisions-2 through –16 for specific content requirements, and particular requirements for submittal of special warranties.

Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, by the Contractor, subcontractor, supplier, or manufacture Organize the warranty documents into an orderly sequence based the table of contents of the Project Manual.

Bind warranties and bonds in heavy-duty, commercial quality durable 3-ring vinyl covered loose-leaf binders, thickness necessary to accommodate contents, and sized to receive 8-1/2" 11" paper.

Provide heavy paper dividers with celluloid covered tabs for each separate

warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and t name, address and telephone number of the installer.

Identify each binder on the front and the spine with the type or printed title "WARRANTIES AND BONDS, the Project title name, and the name of the Contractor.

When operating and maintenance manuals are required f warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

SCHEDULE OF WARRANTIES

Schedule: Provide warranties and bonds on products an installations as specified in the following Sections but not limited to:

- Architectural Products
- Mechanical Warranties
- Electrical Warranties

END OF SECTION 01740

SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes the following:

- Removal of trees and other vegetation
- Removal of concrete
- Topsoil stripping, stockpiling and re-spreading
- Clearing and grubbing
- Removing above-grade improvements
- Removing below-grade improvements

PROJECT CONDITIONS

Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

Protect improvements on adjoining properties and on Owner's property.

Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

Provide Protection for Roots: Trees over 1-1/2" diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other

acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

SITE CLEARING

General: Remove trees, shrubs, grass ad other vegetation, improvement, or obstructions as required permitting installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes digging out and off-site disposing of stumps and roots.

Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonable free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, foliage, and other objectionable material.

Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

Remove heavy growths of grass from areas before stripping.

Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent rain and wind erosion. Reuse top soil suitable for finish and fine grading.

Dispose of unsuitable or excess topsoil same as specified for disposal of waste material in area designated by Owner.

Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

Completely remove stumps, roots, and other debris protruding through ground surface.

Use only hand methods for grubbing inside drip line of trees indicated to remain.

Fill depressions caused by clearing and grubbing operations with satisfactory
soil material, unless further excavation or earthwork is indicated.

Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction. Existing storm drainage shall be repaired as required.

DISPOSAL OF WASTE MATERIALS

Burning on Owner's Property: Burning is permitted on Owner's property as long at the Parish will allow burning and correct permits applicated.

Removal from Owner's Property: Remove waste materials, concrete, and unsuitable topsoil from Owner's property. All useable topsoil shall be placed on Owner's spoil area.

All items shall be disposed properly per Parish / City Ordinances and Codes.

END OF SECTION 02110

SECTION 02200 - EARTHWORK

PART ONE -GENERAL

DESCRIPTION

Provide excavation, backfill and compaction as indicated on the drawings and specified herein.

Provide additional fill material as required to replace excavated dirt not meeting requirements specified herein.

Also included are all necessary shoring, bracing and drainage equipment.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:

Testing Laboratory Services: Section 01410
Grading: Section 02110 – Site Clearing
Concrete:Division 03100 thru 03300
Excavating & Backfilling for Plumbing, Mechanical & Electrical Work: See Respective
Sections

OUALITY ASSURANCE

Testing laboratory, employed by Owner, to perform in-place soil compaction tests and material for controlled fill.

SUBMITTALS

Contractor to submit testing laboratory report certifying that controlled fill material used on the project meets requirements of this Section.

JOB CONDITIONS

Contractor to contact “DOTTIE” prior to start of construction to locate all known utilities.

Verify location of all existing utilities shown on drawings. Before beginning machine cutting, hand excavate to determine exact depth of existing utilities. Contractor assumes full responsibility for maintaining all existing utility services through lines

indicated to remain.

Active utilities shown on drawings shall be adequately protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered but not are shown on drawings, notify Architect and adequately protect and support until advised by the Architect. Inactive and abandoned utilities encountered in excavation operations shall be reported to the Architect. Remove, cap or plug as directed by the Architect. In absence of specified instructions, cap or plug or as required by local authorities.

PROTECTION

Protect utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavation operations.

PART TWO - PRODUCTS

FILL MATERIAL

All backfill material shall have a maximum liquid limit of 35 and a maximum plasticity index of 15.

Excavated material that is approved by Architect may be used for backfills. All unsuitable material, and all surplus excavated material not required for backfill shall be removed from the site. The location of dump and length of haul shall be the Contractor's responsibility.

Provide and place any additional fill material from off the site as may be necessary.

Submit samples of the fill material to the laboratory for testing (2) weeks in advance of the time of use.

Furnish written verification of the Classification prepared by an Independent Testing Laboratory, and obtain Architect's approval of material prior to starting this phase of the work.

In areas of the building where fill exceeds one foot, a geo-textile fabric shall be placed n subsoil prior to the placement of fill.

PART THREE - EXECUTION

EXCAVATION

The contractor shall strip the site of all organic material, any paving material, tree roots and any other deleterious material. Site stripping shall be extended to a point 10 feet outside the foundation limits of the proposed building and from areas to be occupied by roads, walks, slabs and from areas that will receive cut and fill operations required to complete the site work specified on the drawings. The topsoil shall be placed in designated areas approved by Architect. Placement of the top soil shall not be placed in areas that will interfere with building or utility operations. All topsoil used on the project for finished grading shall be reasonably free from unsuitable subsoil excavation, debris, stones, roots or brush.

Areas where concrete or utilities or placed shall be excavated to the required depths, lines, and elevations as indicated or required for the project construction. Concrete excavations for footings, grade beams, shafts, or tie beams shall be of sufficient widths for the placement and removal of forms and to provide necessary room for proper compaction equipment to be used to insure proper soil compaction adjacent to these areas. Areas excavated for the placement of utilities shall be wide enough to provide for compaction of soil around each utility placed. The bottom of concrete structures and utilities shall be on firm undisturbed soil.

If the soil conditions require changes in the depth of the footings or other sub-surface work, such changes shall be made as directed by the Architect. Contractor shall not proceed with any changes that are not pre-authorized by the Architect or Owner. Testing laboratories used on the project shall notify the Architect of any possible soil condition that may require changes in the soil excavation.

Footings and foundations shall not be placed on disturbed soil. Footings and foundations shall be placed at the elevations shown on the drawings.

Provide and install the necessary shoring, cribbing, bracing, etc., as may be required to prevent caving and to protect adjacent buildings, property and the public. Bracing of all concrete footings, walls, piers, and beams shall be maintained until the newly placed concrete has reach sufficient strength to provide permanent support of itself or other types of construction.

All excavated areas shall be protected from both surface and ground water that may be encountered on the site during the construction period. Contractor shall provide and maintain all pumps and related equipment necessary to protect the excavated areas from water during the progress periods of the project. Contractor shall take precautions to protect, with barricades if necessary, excavated areas of the project.

BACKFILL

After completion of footings, piers, grade beams, or other work below the surface of the ground, all formwork shall be removed. Any imperfections in the concrete shall be repaired and the excavated areas shall be backfilled using select material specified herein. The backfill shall be placed in six (6) inch horizontal layers to compaction requirements specified herein. Fill against grade beams and walls shall be placed only after the concrete has reached sufficient strength, as determined by strength tests or approval of the Architect, to withstand the pressure of the compaction equipment. Fill on both sides of the grade beams or walls shall be at the same time.

Place backfill and fill materials in layers not more than eight (8) inches in loose depth for material compacted by heavy compaction equipment and not more than four (4) inches in loose depth for material compacted by hand -operated tampers. Soil density requirements are specified herein this section.

Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum dry density or relative dry for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.

Provide and place additional earth fill materials needed to bring existing site elevations to the finish grades indicated on the drawings for the construction of buildings, walks, paving and finished site grading elevations

COMPACTION

Provide standar proctor for compaction.

Upon completion of the stripping of the site and prior to filling operations beginning, the site shall be inspected by the Architect to determine if any soft areas exist in the areas to receive select fill. The Architect may request that the site be proof-rolled using equipment that will not create a pumping affect to the subsoils that will receive the fill material. The Architect or his Engineer shall be the determining factor as to whether the site shall be proof-rolled. No additional monies will be given to the contractor if proof-rolling the site is required. Any localized soft areas of the site that are determined to be removed shall be replaced as directed by the Architect. Contractor shall receive a change order for the removal and replacement of the soil if required.

All fill material under slabs and pavements shall be compacted to a density of *95%* in accordance with ASTM D1557 and ASTM D1558. Compact all other backfills to 90% density in accordance with ASTM *D1557.* The top eight (8) inches of existing soil after excavation shall be scarified and compacted to obtain 92 % density per

D1557 and D1558. Each compacted area shall be approved prior to the placement of the next lift of fill material.

LABORATORY TESTS OF COMPACTED FILL

See Section 01400

EXCESS & WASTE MATERIALS

Remove from site and legally dispose of waste materials, including excess soil, rock, trash and debris.

END OF SECTION 02200

SECTION 02276 – EROSION CONTROL REQUIREMENTS

PART 1 - GENERAL

DESCRIPTION

The work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary.

Temporary erosion controls include, but are not limited to, grassing, mulching, setting, watering, and reseeding onsite surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner.

Temporary sedimentation controls include, but are not limited to silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Owner.

Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

It shall be the responsibility of the Contractor to attain all permits and associated documentation necessary to provide a Storm Water Pollution Prevention Plan for the construction sites. (See drawings)

REFERENCE DOCUMENTS

State of Louisiana
City or Parish Building Code
International Building Code.

PART 2 - PRODUCTS

EROSION CONTROL

Netting – fabricated of material acceptable to the Owner.

Straw mulch shall be utilized on all newly graded areas to protect areas against washouts and erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or rye that is free from noxious weeds, mold or other objectionable material. The straw mulch shall contain at least 50 percent by weight of material to be 10-in. or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment.

SEDIMENTATION CONTROL

Bales – clean, seed-free cereal-hay type.

Netting – fabricated of material acceptable to the Owner.

Filter stone – crushed stone conforming to State D.O.T.D. Specifications.

Concrete block – hollow, non-load-bearing type.

Concrete – exterior grade not less than one inch thick.

SILT FENCE

Steel posts shall be a minimum of 5-ft in length, 2-1/2-in. by 2-1/2-in. by 1/4-in. angle post with self-fastening tabs and a 5-in. by 4-in. (nominal) steel anchor plate at bottom. 2-in. x 2-in. wood stakes with a minimum of 5-ft length may be used in lieu of steel posts.

Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.

Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc., Charlotte, NC or equal.

Tie wires for securing silt fence fabric to wire mesh shall be light gauge metal clips (hog rings), or 1/32-in. diameter soft aluminum wire.

Prefabricated commercial silt fence may be substituted for built-in-field fence. Prefabricated silt fence shall be “Envirofence” as manufactured by Mirafi Inc., Charlotte, NC or equal.

PART 3 - EXECUTION

EROSION CONTROL

Minimum procedures for grassing are:

Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 2-inch in diameter and debris.
Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2-inches.
Apply netting over mulched areas on sloped surfaces.

Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

SEDIMENTATION CONTROL

Install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Hay bales which deteriorate and filter stone which is dislodged shall be replaced.

Silt Fence Installation

Silt Fences shall be positioned as necessary to prevent off site movement of sediment produced by construction activities as directed by the Engineer.
Dig trench approximately 4-in. wide and 4-in. deep along proposed fence lines.
Drive metal-stakes, 6-ft on center (maximum) of wood stakes, 3-ft on center (maximum) at back edge of trenches. Stakes shall be driven 2-ft (minimum) into ground.
Hang 4 by 4 woven wire mesh on posts, setting bottom of wire in bottom of trench. Secure wire to posts with self-fastening tabs.
Hang filter fabric on wire carrying to bottom of trench with about 4-in. of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and secure with tie wires 12-in. O.C. both ways.
Backfill trench with excavated material and tamp.
Install pre-fabricated silt fence according to manufacturer's instructions.

Staging areas and access ways shall be surfaced with a minimum depth of 4-in. crushed stone.

MAINTENANCE AND INSPECTIONS

Inspections

Make a visual inspection of all sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas or into the vent trench, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

Device Maintenance

Silt Fences
Remove accumulated sediment once it builds up to one-half of the height of the fabric.
Replace damaged fabric or patch with a 2-ft minimum overlap.

Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.
Add crushed stone to access ways and staging area as necessary to maintain a firm surface free of ruts and mudholes.

PERFORMANCE

Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the State of Louisiana and the City, Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION 02280

SECTION 02282 - TERMITE CONTROL

PART ONE - GENERAL

DESCRIPTION

Provide soil treatment for termite control under and around buildings or construction as described below.

Provide termite treatment on existing wood sleeper system at auditorium once existing flooring is removed and prior to installation of new wood floor.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Earthwork: Section 02200
Cast-in-Place Concrete: Section 03300

QUALITY ASSURANCE

Applicator shall be registered or licensed as required by state or other governing jurisdictions.

Applicator shall comply with termite control requirements of the state or other governing jurisdictions and with the requirements of this Specification where it exceeds other requirements. Should Government Regulations outlaw or restrict use of any pesticide as specified, Contractor shall submit revised and equal treatment to Architect prior to application.

GUARANTEE

Deliver to the Owner a bonded guarantee that the below listed requirements have been met and that re-treatment will be made, without cost to Owner, on evidence of termite infestation within a period of five *(5)* years after date of Substantial Completion. Re-treatment material shall be same quality and rate of concentration as originally used materials.

SUBMITTALS

Before proceeding with the work, provide Architect with manufacturer's mixing and application instructions.

PART TWO - PRODUCTS

MATERIALS

Apply one of the listed chemicals, at not less than the designated concentration, to areas to be treated: Use LA current approved manufacturers but not limited to the listed ones below..

Permethrin

FMC (Dragnet FT & SFR): 0.5 – 1.0 percent applied in water emulsion.

LG Chemical (Permaster 380): 0.5 – 1.0 percent applied in water emulsion.

America, Inc. (Permethrin SFR): 0.5 – 1.0 percent applied in water emulsion.

Co. Solutions (Prelude): 0.5 – 1.0 percent applied in water emulsion.

Zeneca (Tengaro SFR): 0.5 – 1.0 percent applied in water emulsion.

Microflow (Torpedo): 0.5 – 1.0 percent applied in water emulsion.

Bifenthrin

FMC (Biflex TC): 0.06 – 0.12 percent applied in water emulsion.

FMC (Talstar): 0.06 – 0.12 percent applied in water emulsion.

Cypermethrin

Zeneca (Demon): 0.25 – 0.50 percent applied in water emulsion.

FMC (Prevail): 0.30 – 0.60 percent applied in water emulsion.

FMC (Prevail TC): 0.30 – 0.60 percent applied in water emulsion.

Fenvalerate

AvrEvo (Tribute): 0.25 – 0.50 percent applied in water emulsion.

Proprietary materials, which pass a 5-year test by U. S. Forest Service or U. S. Department of Agriculture, and contain one or more of the above chemicals in the proper concentrations, and can provide proof that no toxic effect will result in human, beneficial plant or animal life, are acceptable. Contractor shall not use any

material that is banned or prohibited by any U. S. Government Agency. If any such material is called for herein, Contractor shall notify Architect, who will select an acceptable substitute.

MIXES

Follow manufacturer's mixing instructions.

PART THREE - EXECUTION

INSPECTION

Notify Architect 48 hours prior to planned application of chemicals. Do not proceed without approval of Architect.

Do not begin work until all fill under slabs has been compacted, and after piping and other sub-slab work is in place. Treat before installation of vapor barrier.

Verify that soil is in friable condition with moisture content low enough to permit absorption of toxicant solution.

APPLICATION

Apply to areas beneath concrete floor slabs on grade or fill, and along both sides of interior and exterior grade beams.

Apply also at expansion joints, construction joints, conduit, piping and other construction penetrations through slabs.

SLABS ON GRADE: One (10) gallon to each ten (10) square feet of area within building lines.

GRADE BEAMS: One (1) gallon (each side) for each for (4) lineal feet of grade beam.

EXPANSION AND CONSTRUCTION JOINTS: Two (2) gallons for each five *(5)* linear feet of joint.

PIPE CONDUITS & OTHER SLAB PENETRATIONS: Two (2) gallons for each seven (7) square feet for a minimum radius of three (3) feet from penetration.

PROTECTION

Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.

Cover areas immediately following application of material.

Provide protection necessary to prevent human and animal contact with treatment materials and with treated surfaces.

Protect persons from injury and property damage. Satisfactorily repair or remove and replace work that has been damaged.

CLEANING

Clean adjacent surfaces not intended for treatment from soil, stain and adhered materials. Remove and replace damaged work that cannot be restored to original conditions.

Remove excess material and debris from site.

END OF SECTION 02282

SECTION 02500 - SITE DRAINAGE

PART ONE - GENERAL

DESCRIPTION

Provide site drainage, including concrete drainage structures, galvanized, asphalt coated metal pipe, and cast-iron frames and grates, as shown on the drawings and specified herein.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Earthwork: Section 02200
Cast-in-Place Concrete: Section 03300

QUALITY ASSURANCE

All products to meet specifications requirements.

Laboratory testing of controlled fill, compaction tests and concrete tests.

SUBMITTALS

Furnish certificates that products meet specification requirements.

JOB CONDITIONS

Pour no concrete unless ambient temperature is 40 degrees and rising.

Do not deposit concrete on wet or frozen ground.

PART TWO - PRODUCTS

MATERIALS

STORM DRAINAGE: As per 1992 edition of the “Louisiana Standard Specifications for Roads and Bridges”, sizes as indicated on drawings. Provide ADS HDPE Corrugated Plastic Pipe, HPStorm, Dual Wall Pipe Sure-Lok F477 Pipe by Hancor or equal. Joints shall be bell and spigot. Meets AASHTO M252, Type S; AASHTO M294, Type S; AASHTO MP7-97. Drawings may indicate exact type of piping.

PIPE FITTINGS: Provide fittings meeting AASHTO M252 Type S; ASSHTO M294

Type S; or MP7-97

CAST IRON FRAMES & GRATES:

Heavy-duty traffic shall be located in driveways or as indicated on drawings.

Standard Light-duty shall be located in the yard/grass areas as indicated on drawings.

SIDEWALK DRAIN: Shall be concrete and metal as indicated on drawings.

CONCRETE CATCH BASINS: Shall be concrete as indicated on drawings. (03300 – Cast-In-Place Concrete) Pre-Cast concrete catch basins will be accepted if drawings indicate that information. Crack basin will be sent back and new ones delivered unless drawings indicate otherwise.

PART THREE - EXECUTION

INSPECTION

Verify locations and depths of all lines and other utilities before excavating for drainage system. (02200-Earthwork)

Verify finish elevations and flow lines of drainage structures and pipe to assure proper drainage of entire system.

INSTALLATION

Construct drainage structures as detailed.

Lay pipe to true and proper grades and alignment as shown on plans and as directed by the Architect, in a trench, the width of which is not less than twelve (12) nor more than eighteen (18) inches greater than the outside diameter of the pipe.

The bottom of the trench shall be shaped to fit the contour of the pipe for a depth equal to at least one-tenth (1/10) the outside diameter of the pipe.

Lay all pipe with the bell upstream.

Use carborundum saw to make all cuts in concrete pipe.

Apply joint material in a manner as recommended by manufacturer.

Wrap all joints with filter fabric prior to backfilling.

Do not backfill trench until pipe and joints are inspected and approved by Architect. Replace all damaged pipe and unsatisfactory joints.

Backfill and compact as specified in Section 02220.

PATCHING, FINISHING & CLEAN-UP

Patch and grout all exposed joints in pipe and drainage structure.

All concrete pipe edges to be neat and smooth.

Finish exposed cast-in-place concrete as specified.
Clean out drainage structures and grout bottom to slope to pipe. Clean all pipe.

Clean metal frames and gratings.

END OF SECTION 02500

SECTION 02520 - PORTLAND CEMENT CONCRETE PAVING & WALKS

PART ONE - GENERAL

DESCRIPTION

Provide portland cement concrete pavings and walks as indicated on the drawings and specified herein, including driveways, parking areas, curbs, walks, catch basins and inlets.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Testing Laboratory Service: Section 01410
Site Clearing: Section 02110
Earthwork: Section 02200
Site Drainage: Section 02500
Concrete Formwork: Section 03100
Concrete Reinforcement: Section 03200
Cast-in-Place Concrete: Section 03300

QUALITY ASSURANCE

All concrete paving work shall conform to the requirements of the Portland Cement Association's "Specifications for Plain and Reinforced Concrete", latest revisions, and American Concrete Institute's "Building Code Requirements for Reinforced Concrete", ACI 318, latest revision.

Testing laboratory, employed by Owner, shall perform testing of paving concrete. See Section 01410.

JOB CONDITIONS

Do not place concrete when ambient temperature is below 40 degrees F and falling; or 40 degrees F and above, but predicted to fall to 32 degrees F or below within 24 hours after termination of the pour.

Do not place concrete in rain or on frozen ground, or un-prepared.

PART 2 - PRODUCTS

MATERIALS

IF NOT INDICATED ON DRAWING - CONCRETE: In accordance with Section 03300, shall attain a compressive strength of 3500 psi in 28 days @ paving. Use 3000 psi in 28 days @ sidewalks and catch basins or as indicated on drawings. Use 4000 psi in 28 days @ curb and gutters.

REINFORCING STEEL: 6 x 6 x 6 gauge WWM (Mats) unless otherwise indicated on plans @ paving only. Use pre-cast concrete blocks 3" x 8" x thickness required for proper clearance of bottom layer of steel. Irregular or broken pieces not permitted. Concrete for blocks to be of same density as concrete in which it is placed. Steel chairs maybe used in lieu of concrete blocks.

EXPANSION JOINT MATERIAL: Pre-molded, non-extruding, bituminous saturated fiber board meeting requirements of ASTM D-1751 of thickness as indicated.

WOOD EXPANSION JOINTS: Provide ¾" redwood with plastic expansion cap to be removed for joint sealant.

FORMS: Either steel or wood, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use forms that are straight and free of distortion and defects. Use flexible steel forms or laminated boards to form radius bends as required. Coat forms with a non-staining form release agent that will not discolor or deface the concrete surface.

METAL EXPANSION CAPS: Provide one for end of each dowel bar in expansion joints.
Design caps with one closed and a minimum length of 3" to allow bar movement of not less than 1".

JOINT SEALANT: Cold applied, two part, job mixed, self-leveling urethane compound conforming to Fed Spec. TT-S-00227 Type I, Class A, Service Temperature Range -40 degrees -180 degrees F. Accepted product "Sonolastic Paving Joint Sealer: by Sonneborn - Contech; "NR-l00" by Pecora Corp. Furnish in gray color.

SAND CUSHION: 2" thickness DOTD Designation TR 423 Class A-3 @ walks or as indicated on drawing otherwise. Provide 4" thickness @ foundation for leveling purposes.

Minimum requirements are not minimum average values. Minimum average values per roll are not an acceptable specification.

PARKING CURBS: Provide concrete 9" wide x 6" high x 6' long with 1 ½" chamfers @ top (each side) w/ 2-#3 bars continuous thru curb and anchor curb with #4 rods (2'-0" length minimum- 3 per curb.) If indicated on plans.

PART THREE - EXECUTION

INSPECTION

Verify that all grading and earthwork are completed and sub-grade is at required elevation.

Check that sub-grade is level, compacted and free of excessive moisture or frost to receive sand base Sub-grade for paving shall be compacted to density specified in Section 02110.

Determine that manholes, area drains and other drainage structures are at required elevation and alignment. Verify proper drainage to all structures.

Install and securely fasten all embedded items before placing concrete.

Place and level sand cushion over sub-grade under all paving. Depth of cushion to be 2" under drives, parking and sidewalks, unless detailed otherwise.

FORMS

Set forms to required grades and lines, rigidly braced and secured. Clean forms after each use, and coat form with oil as often as required to ensure separation from concrete without damage. Do not remove forms before concrete has taken final set.

EXPANSION JOINTS

Set Expansion Joint material to required grades and lines, rigidly braced and secured to resist movement during concrete placement and to retain horizontal and vertical alignment.

Area within paving areas shall not exceed 20' x 20' without placement of expansion joints unless drawn otherwise.

Maximum length of sidewalk run shall not exceed 16' without placement of expansion joint unless drawn otherwise.

Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is required.

Furnish joint fillers in one piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

Protect top edge of the joint filler furring concrete placement with a metal cap or other temporary material. Remove protection prior to cleaning and sealing of joints.

Install dowel bars maximum 18" o.c. (unless noted otherwise) accurately in joint assemblies, each parallel to surface of concrete paving and walk and to each other. Rigidly secure in place by dowel supports to prevent displacement during paving operations. Coat 1/2 length of each dowel with grease or heavy oil and insert greased end into metal cap to allow 1" mm. bar movement.

CONSTRUCTION CONTROL JOINTS

Construct scored construction joints in all walks, maximum spacing 4' o.c., equally spaced between expansion joints.

Provide construction control joints to a depth equal to 1/4 the thickness of the concrete. Weakened planes shall be created by sawing or tooling method at Contractor's option. Do not saw joints until concrete has hardened sufficiently to prevent spalling or damage to edges of joints. Reinforcement shall be continuous thru contraction joints.

REINFORCEMENT

Place welded wire mesh and re-bar reinforcement accurately in position as detailed on drawings. Firmly secure all bars against displacement and keep welded wire mesh from bottom of formed area.

Install dowel bars in pavement and walk expansion joints, each parallel to surface of concrete and to each other. Rigidly secure in place by dowel supports.

CONCRETE PLACEMENT

Do not place concrete until sub-base and forms have been checked for line and grade. Moisture sub-base if required to provide a uniform dampened condition at the time concrete is placed.

Deposit concrete as nearly as practicable in its final position. Place concrete for full thickness in one operation without change in proportions.

Place concrete using methods which prevent segregation of the mix. Consolidate

concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place a construction joint.

Before depositing new concrete against old, clean existing surface and apply bonding agent in accordance with manufacturer's instructions.

When construction joints are required by the drawings, adjacent slab sections shall not be placed on the same day.

When adjacent pavement lanes are placed in separate pours, do not operate equipment on the concrete until the pavement has attained sufficient strength to carry the loads without injury.

Place curb reinforcing ties into paving slab while concrete is still wet. Place curb concrete and rod curb concrete into slab to insure bond. Accurate form integral curb with a "mule" to correct profile, creating a coved intersection between curb and paving slab.

After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compare the surface and produce a uniform texture.

After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and re-float repaired areas to provide a continuous smooth finish. No dust coating permitted.

Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/3" radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.

After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

DRIVES AND PARKING AREAS: Heavy coarse broom finish. Final finish subject to Architect's approval.

WALKS: Light broom finish at right angles to long dimension. Final finish subject to Architect's approval.

INCLINED SURFACES: Coarse, non-slip finish be scoring with a stiff-bristled broom, perpendicular to line of traffic.

HANDICAP CURB RAMPS: Provide tactile warning surface at handicap curb ramps as indicated on drawings.

CURBS

While the concrete is green, finish the top and face of the curb by rubbing the surface with a wood or concrete rubbing block and water until all blemishes, form marks, and tool marks have been removed. Ample water shall be used during the rubbing to avoid a plastered condition. The flow lines of gutters shall be finished to cove profile. The rubbed surface shall then be brushed with a fine-textured brush to obtain a uniform surface.

CURING

Immediately after finishing operations, and while surfaces are still moist, apply curing materials in accordance with manufacturer's recommendations. Curing material shall form an effective seal to prevent evaporation or loss of moisture from the concrete for the full curing period of 7 days.

Do not remove forms for 24 hours after concrete has been placed. Remove forms carefully to prevent damage to green concrete. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

BACKFILLING

As soon as practicable after form removal and patching, remove debris, broken concrete and trash from edges of curbs and paving and backfill, grade and compact to lines and grades indicated on drawings. Unless indicated otherwise, finish grade shall be 2" below edges of concrete.

SEALING JOINTS

After the expiration of the curing period, remove temporary top fillers at expansion joints. Clean expansion joints and other (tooled) joints. Joints which do not comply with detail or specification requirements shall be cut with power saw to form a groove of required dimensions. Grooves shall have edges free of ravels and spalls. Grooves shall be straight from edge to edge of pavement and shall not vary more than 1/2 inch from alignment.

Seal joints immediately after joint preparation. Seal joints in accordance with

sealant manufacturer's instructions. Remove surplus and spilled sealer.

GROOVING & SEALING CRACKS

Random cracks, except those specifically excluded by the Architect, that occur in the pavement during construction shall be grooved and sealed. The top of the crack shall be grooved to a depth of 3/4 inch and to a width not less than 3/8 inch or more than *5/8* inch by means of an approved mechanical grooving machine. The grooving tool shall be capable of following closely the path of the crack and of widening the top of the crack to the required section without spilling or otherwise damaging the concrete. Loose and fractured concrete shall be removed, and the groove shall be thoroughly cleaned and completely filled with joint sealing material.

REPAIRS & PROTECTION

Repair or replace broken or defective concrete, as directed by Architect.

Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION 02520

SECTION 03100 – CONCRETE FORMWORK

PART ONE – GENERAL

DESCRIPTION

Provide formwork, ties, coating, water stops, metal construction joints, anchors and accessories as required for concrete work indicated on the drawings, specified herein, or otherwise required.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Concrete Reinforcement: Section 03200
Cast-in-Place Concrete: Section 03300

SUBMITTALS

Description and recommended installation instructions for form ties, spreaders, form coatings.

PRODUCT DELIVERY. STORAGE & HANDLING

On delivery to job site, place materials in area protected from weather.

Store and handle materials in manner to prevent damage.

MATERIALS

PART TWO - PRODUCTS

LUMBER: Softwood framing lumber; kiln dried, PS 20, No. 2 common grade. Grade marked by grading rules agency approved by American Lumber Standards Committee.

PLYWOOD: Exterior type softwood plywood, PS 1, panel veneer grades BB. Each panel stamped or branded indicating veneer grades, species, type and identification. Mill-oiled sides and mill-sealed edges of panels.

FORM COATING: Nonstaining mineral oil approved by the Architect.

FORM TIES: Metal, adjustable in length, designed so metal can be cut off one inch

back from finished surface.

CORNER FORMERS: Wood or plastic chamfered face.

METAL CONSTRUCTION JOINT: 20 gauge galvanized steel tongue & groove metal key joint. Size as per thickness of concrete. Contractor shall provide construction joints as indicated on plans.

SAWCUT CONSTRUCTION JOINT: Provide 3" deep saw-cuts in foundation as indicated on drawings or otherwise indicated.

PART THREE - EXECUTION

GENERAL

Forms for exposed concrete surfaces shall be plywood of uniform thickness to produce smooth, even surfaces. Forms for unexposed surfaces may be No. 2 common grade or better lumber. Provide temporary openings in formwork for concrete placement.

All concrete shall be placed in forms except footing and grade beam bottoms. Sides of footings may be earth formed provided soil is stable enough to assure clean, straight and vertical lines.

Construct forms true to line, grade, shape and dimensions of concrete element, mortar tight, and of such construction to permit removal.

Forms shall be sufficiently rigid to prevent displacement or sagging between supports. Contractor shall be responsible for their adequacy and shall correct all work caused by improper form construction.

Form surfaces shall be smooth and free from irregularities, dents, sags or holes when used for permanently exposed concrete. Provide chamfered external corners for beams and columns exposed to view.

FORM COATING: Coat forms for all exposed concrete surfaces. Apply coating before setting reinforcing. Remove all coating from reinforcing steel. Forms for unexposed surfaces may be thoroughly wetted with water in lieu of oiling, immediately before placing of concrete.

FORM TIES: Locate ties at rustication marks, control joints, or points where visual effect will be minimized. Locate ties equidistant and symmetrical, lined up both

vertically and horizontally. Bolts and rods used for internal ties to be removed, shall be coated with grease. Wire ties will not be permitted where concrete surface is exposed.

BUILT-IN ITEMS: Built-in anchors, inserts, and bolts required for the connection of other materials. Build-in sleeves, thimbles and other items furnished by other trades.

BASES FOR EQUIPMENT: Provide wood forms for concrete bases as required for mechanical & electrical equipment items. Refer to Architectural, Structural, Mechanical and Electrical Drawings for quantity and size. Coordinate with Mechanical & Electrical Contractor.

FORM RE-USE: Clean and repair surfaces of forms to be re-used. Split, frayed, de-laminated or otherwise damaged form facing material not acceptable. Apply form coating prior to re-use. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. I do not use “patched” forms for exposed concrete surfaces, except as acceptable to Architect.

FORM REMOVAL: Do not remove forms or shoring without approval of Architect. Remove forms in manner to insure complete safety of work and prevention of defects. Any failure, damage or defects arising from removal of forms or shores is the sole responsibility of the Contractor.

Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and other parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. for 48 hours after placing concrete, provided curing and protection procedures are maintained.

Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained the 28 day minimum compressive strength.

Rods which are to be entirely removed from the wall shall be loosened 24 hours after concrete placed, and form ties, except for a sufficient number to hold forms in place, may be removed at this time. Ties wholly withdrawn from wall shall be pulled toward the face that will be concealed from view in the permanent work.

RE-SHORING: Comply with ACI 347 for shoring and re-shoring of all suspended concrete as herein specified. Extend shoring from ground to bottom of all suspended concrete unless otherwise permitted.

Space out shoring in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums if required to ensure the proper distribution of loads throughout the structure. Remove shores, and re-shore in a planned sequence to avoid damage to partially cured concrete.

Locate and provide adequate re-shoring to safely support the work without excessive stress or deflection. Keep re-shores in place a minimum of 15 days after placing upper tier, and longer if required, until the concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

END OF SECTION 03100

SECTION 03200 - CONCRETE REINFORCEMENT

PART ONE - GENERAL

DESCRIPTION

Provide concrete reinforcement, supports, wire and accessories as indicated on the drawings and specified herein.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements
Concrete Formwork: Section 03100
Cast-in-Place Concrete: Section 03300

QUALITY ASSURANCE

Comply with requirements of ACI Code and CRSI. Steel shall be of domestic manufacture. Foreign made steel not acceptable.

SUBMITTALS

Submit shop drawings for approval. Submittals shall include schedules, bending, and placement location in the work and other pertinent information.

Drawings shall be checked in the fabricators drafting room and so noted before submission; all bars, including straight bars, shall bear a placing mark and the drawings shall show the location of each bar in the structure. Bar lists alone are not considered adequate for this purpose.

Furnish certified copies of mill tests with all deliveries of reinforcing steel.

STORAGE MATERIALS

Subject to approval of the Architect and to allow easy access for inspection and definite identification of each shipment in accordance with report of tests. Store to prevent rust or accumulation shall be of foreign matter.

Coordinate placement of reinforcing steel with requirements of other trades. No cutting of reinforcement or displacement of bars shall be done by any of the trades without the consent of the Architect, and then only when adequate reinforcement is provided to replace the design requirements.

PART TWO - PRODUCTS

MATERIALS

REINFORCING STEEL: Meet requirements of ASTM A-61 *5,* Grade 60, except #3 allowed by Current ACI 318 Building Code Requirements for Reinforced Concrete. Reinforcing steel shall be new, clean and free of heavy rust and scale.

WELDED WIRE FABRIC MATS: Meet requirements of ASTM A-185. Provide 6 x 6 x 6 gauge WWM (Mats) unless otherwise indicated. See drawings for location and use.

TOP WIRES: Black, annealed, 14 gauge.

REINFORCEMENT SUPPORT: Chairs, spacers and other devices for supporting, spacing and fastening reinforcement shall be of proper size to safely carry the construction loads as recommended by CRSI. Supports and spacers occurring in exposed concrete surfaces shall be zinc or plastic coated. Spacing of supports and spacers shall conform to requirements of CRSI and as specified herein.

SUPPORTS FOR FOOTINGS, BEAMS AND SLABS ON GRADE: Use pre-cast concrete blocks 3" x 8" with thickness required for proper clearance of bottom layer of steel. Irregular or broken pieces not permitted. Concrete for blocks to be of same density as concrete in which it is placed. Space supports in footing and beams 4'-0" o.c. maximum and in slabs-on-grade 4'-0" o.c. maximum each direction. Steel chairs may be used in lieu of concrete blocks.

SHOP FABRICATION

Cut, form and fabricate all reinforcement to shapes indicated and to conform with requirements of ACI Code. Bend bars cold and free of cracks, splits or kinks. Provide proper clearances.

Bar lengths noted in the various schedules are approximate finished fabricated lengths for estimating purposes only. Make stirrups with four inch hook.

PART 3 – EXECUTION

PLACEMENT

Place bars accurately in position. Firmly secure all bars against displacement with wire and specified supports and spacers before concreting is begin. Space supports in accordance with recommendations of ACI Code.

All suspended concrete shall be reinforced.

At time concrete is placed, metal reinforcement shall be free from mud, oil or other nonmetallic coatings that adversely affects bonding capacity.

TOLERANCES

Unless otherwise specified by the Engineer, reinforcement shall be placed within the following tolerances:

Tolerance for depth d, and minimum concrete cover in flexural members, walls and compression members shall be as follows:

		Tolerance on d	Tolerance minimum concrete cover
d	≥	± 3/8 in.	- 3/8 in.
d	>	± ½ in.	- 3/8 in.

Except that tolerance for the clear distance to formed soffits shall be minus 1/4 in. and tolerance for cover shall not exceed minus one-third the minimum concrete cover required in the contract drawings or in the specifications.

SPLICING: Make splices of reinforcement at points of minimum stress, length to 30 bar diameters, minimum of 15 inches.

LINTELS: Provide reinforcing steel for all reinforced concrete filled masonry lintels and bond beams. Unless otherwise noted, lintels will require two No. 5 bars for 6" partitions or less, and four No. 5 bars for 8" and 12" partitions. Length of lintel bars shall be masonry opening, plus 1'- 4". Bond beam reinforcing shall be as called for on drawings.

INSPECTION OF STEEL PLACEMENT

The Architect or his representative shall be given 24 hours notice to inspect placement of reinforcing steel before concrete is placed. Such inspection is in nature of assisting Contractor to minimize errors, and in no case will it serve to relieve Contractor of his responsibility to provide materials and workmanship

required by Contract Documents

MISC. STEEL: In addition to the reinforcing shown on plans supply 1000 l.f. No. 4; 1500 l.f. No. 5 and 1500 1.f. No. 6 in twenty foot lengths. Contractor shall cut and place bars at direction of Engineer if deemed necessary @ no additional expense to the owner.

END OF SECTION 03200

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART ONE - GENERAL

DESCRIPTION

Provide all structural and architectural concrete and related items where shown on drawings, as required, and as specified herein, including:

Concrete beams, floor slabs, vapor barrier, foundations, embedded items and anchors, concrete finishes and miscellaneous concrete.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Concrete Formwork: Section 03100
Concrete Reinforcement: Section 03200
Membrane Waterproofing: Section 07110

QUALITY ASSURANCE

Materials and workmanship for Portland Cement concrete shall conform to the requirements of the Portland Cement Association's "Specifications for Plain and Reinforced Concrete", latest revisions. Other publications (latest revisions), and American Concrete Institute's "Building Code Requirements for Reinforced Concrete, ACI 318-95," latest revision.

Testing Laboratory, employed by Owner, shall perform testing of cast-in-place concrete.

CONCRETE FIELD TESTS: Four (4) 6 inch by 12 inch concrete cylinders shall be molded for each 50 cubic yards or each day's pour if less than 50 cubic yards. Cylinders shall remain undisturbed in a secure location on the site for 24 hours after which they shall be removed to the testing lab by laboratory personnel. Two of the cylinders shall be tested at 7 days and two at 28 days. Failure of the concrete to meet the specification requirements may result in its complete removal and replacement at the Contractor's expense. Cost of re-test, if any, will be at the Contractor's expense.

MATERIALS

PORTLAND CEMENT: ASTM C-150, Type 1. Use same brand of cement throughout entire project.

COURSE AGGREGATE: Hard, durable, un-coated crushed stone or gravel, ASTM C-33-CIT. Maximum size aggregate: 3/4 of minimum clear spacing between reinforcing bars, but not larger than 1-1/2" for all footings, walls and slabs on grade and 3/4" for all other structural and architectural concrete.

SAND: ASTM C-33-59.

MIXING WATER: Clean, potable, free of oil, acid, vegetable matter, alkalies, salts.

ADMIXTURE: Water reducer and Set Retarder and/or Accelerator: Shall be used in all concrete except footings. USE NO CHLORIDES.

EXPANSION JOINT FILLER: 1/2" thick, except where noted 1" thick, pre-molded, nonextruding material complying with Federal Specification HH-F-341, Type I, wide enough to complete separate abutting concrete members. Provide where detailed and where concrete walks abut other concrete surfaces and at internals not exceeding 36 feet.

CURING COMPOUND: ASTM C-309 approved by Architect. Use Type I, Clear, for interior surfaces and Type 2, White Pigmented, for exterior surfaces.

CHEMICAL HARDENER: CE-204, colorless, sprayed or poured and squeegeed. Sonneborn LAPIDOLITH, Meadows PENA-LITH or L & M CHEM-HARD acceptable.

SEALANT: Two component polysulfide sealant shall be used on all vertical and horizontal surfaces. All primers and installation shall be in strict accordance with manufacturer's instructions. All sealants shall be compatible with back-up material.

METAL ACCESSORIES: Include all spacers, chairs holsters, ties, and other devices necessary for properly placing, spacing, supporting, fastening reinforcement in place. Metal accessories shall be galvanized where legs will be exposed in finished concrete surfaces. Accessories shall conform to requirements of the Concrete Reinforcing Steel Institute (CRSI) " Manual of Standard Practice for Reinforced Concrete Construction."

STRENGTH, PROPORTION, MIXES OF CONCRETE

3000 psi and 3500 (as indicated on plans) @ 28 days, unless otherwise designated. Keep water-cement ratio to a minimum, do not exceed 6-1/2 gallons per bag of cement including free moisture in aggregate, slump between 3" and *5".*

However, the Mix Design shall be proportioned to achieve an average strength of 750 psi higher than the design strength.

Fly ash will not be accepted.

Concrete shall have a minimum of *5* 1/2 sacks of cement per cubic yard of concrete.

All exterior concrete shall be air entrained.

MIXING CONCRETE

Ready-mixed, ASTM C-94, delivery by trucks with power-driven mixers. Plant operator must guarantee not over 15 minute interval between trucks during any pouring operations. Do not add water after truck leaves plant. Do not use concrete held in mixer longer than one (1) hour.

A copy of each truck delivery ticket shall be made available by truck driver to Architect's representative and/or Testing Laboratory Representative at the site. Minimum delivery ticket information shall include:

1. Ticket Number.
2. Mix proportions, including admixtures.
3. Time of batching.
4. Number of cubic yards of concrete on truck.

PART THREE - EXECUTION

PREPARATION

Cast-In-Place Items: Before concrete placing begins, accurately space, position and secure cast-in-place anchorages, wire ties, reinforcing, dowels, expansion joints, construction joints, etc., including bolts, for securing adjoining or collateral materials to concrete work.

Contractors for other trades requiring built-in connections, sleeves, slots, chases, recesses, rough. ins, etc., in concrete work will be required to furnish material and information regarding size and location before forms are erected. Install sleeves in beams only on approval of Architect.

Install vapor barrier in strict accordance, and specified in Section 07110.

INSERTS AND FASTENING DEVICES FOR OTHER WORK

Provide for installation of inserts, conduit, pipe, sleeves, drains hangers, metal ties, shelf angle supports, anchors, bolts, angle guards, stair nosing, dowels, thimbles, metal reglets, nailing strips, blocking, grounds and other fastening devices required

for attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is placed.

BASES FOR EQUIPMENT

Provide concrete for bases as required for Mechanical & Electrical equipment items. Refer to Architectural, Structural, Mechanical and Electrical Drawings for quantity and size. Coordinate with Mechanical & Electrical Contractor.

TEMPERATURE LIMITATIONS

COLD WEATHER: Do not place concrete when ambient temperature is 40 degrees F. or below, and falling. It may be placed when the temperature is 40 degrees F. or above and rising, providing there is no reason to expect a drop in temperature to below 40 degrees F. within 24 hours of the conclusion of the pour.

HOT WEATHER: Do not place concrete when concrete temperature exceeds 90 degrees F. when measured prior to placement on site.

DEPOSITING CONCRETE

Begin placing concrete only after forms, reinforcement, vapor barrier and other conditions are approved by Architect, and all pipes, conduits, sleeves, thimbles, hangers, anchors, flashing and other work required have been properly installed and forms properly cleaned and wetted.

Remove hardened concrete and foreign materials from inner surfaces of conveying equipment before concrete is placed.

Remove water from the space to be occupied by concrete, divert any continuous flow to a sump or remove by pumping.

Convey concrete from mixer to forms as rapidly as practicable without segregation or loss of ingredients. Maximum slope of chutes: 1 vertical to 2 horizontal. Provide baffle plate and spout or tremies to prevent separation. Concrete shall not be allowed to drop more than four (4) feet.

Deposit concrete as nearly as practicable in its final position in such a manner as to maintain a plastic surface, which is approximately horizontal, and avoid flow along forms. Set screeds to bring slabs to proper levels, required thickness, tamp with suitable tool to force coarse aggregate layers of such thickness that no concrete will be deposited against concrete which has hardened.

If a section cannot be placed continuously, locate keyed construction joints at

points approved by Architect. Before depositing new concrete against old, re-tighten forms, clean hardened surfaces and cover with a coating of neat cement grout.

Thoroughly compact beam concrete during and immediately after depositing by means of approved mechanical vibration in accordance with PCA Specifications ST 26.

When construction joints are required by the drawings, adjacent slab sections shall not be placed on the same day.

CEMENT FINISHES

EXPOSED VERTICAL SURFACES: Form and pour exposed surfaces so that surfaces are finished in appearance when forms are stripped. It is not the intention that these surfaces be rubbed, except to eliminate voids, joints in forms and any loose flakes. Rub such defects to present a complete finished surface, free from visible lines, and from marks. Should any honeycombs appear, neatly cut out and repair in such a manner as to match the adjoining surfaces in texture, rub if necessary.

EXPOSED SURFACES REQUIRING PAINT FINISH: Apply rubbed finish on all exposed concrete surfaces scheduled to receive paint finish. Fine and other projections shall be carefully removed, offsets leveled, and damaged places repaired. Surfaces shall then be rubbed with cement or abrasive bricks and water. Do not use mortar or grout in the rubbing process. Remove from marks and similar blemishes and leave the surface finish uniformly smooth and clean. Use the same cement for patching as used in original concrete.

CEMENT FINISH FLOORS AND FLOORS TO RECEIVE FLOOR COVERINGS: Agitate concrete sufficiently to work aggregate into the body of the slab and to work to the surface sufficient mortar to allow proper floating, trowel with steel trowel until set, leave smooth and level. No dust coat shall be added.

Concrete floors scheduled to receive thin set ceramic tile shall receive a steel trowel and fine broom finish.

CURING

Protect against frost and rapid drying for at least seven days after placing.

As long as forms remain in place, keep concrete well wetted. When forms are removed, treat with curing compound.

Vertical concrete shall be protected by applying an approved curing compound as directed by the manufacturer, and horizontal concrete shall be protected by covering with 8 mil polyethylene sheeting with joints lapped 4 inches and sealed with pressure sensitive tape. Weight sheeting in position.

SEALED CONCRETE FINISH: Apply to interior concrete floors where shown on drawings or in schedules. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats, Saniseal 100 by Master Builders or an approved equal. Apply chemical hardeners in accordance with manufacturer's printed instructions.

LINTELS, BOND BEAMS AND JOINT BEARING LOCATIONS

Concrete shall consist, by weight, of one (1) part Cement and one and one-half (1-1/2) parts of sand and two (2) parts of clean pea gravel. Slump shall not extend three (3) inches.

PATCHES

Fill and finish any honey-combed surfaces with a mortar of one part cement and two parts sand. Where honey-combing or other surface blemishes occur in concrete to be exposed to view, rub to present a uniform appearance.

CLEANING

Upon completion of concrete work, all forms, equipment, and rubbish resulting from this work shall be removed from the premises. All concrete shall be left clean and free of defects.

END OF SECTION 03300

SECTION 04100 - MORTAR & GROUT

PART ONE - GENERAL

DESCRIPTION

Provide mortar, additives and mixing as specified or required for masonry work.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Masonry Reinforcement & Accessories: Section 04150
Brick Masonry: Section 04210
Concrete Unit Masonry: Section 04220

QUALITY ASSURANCE

Mortar mixing shall be supervised at all times by competent, experienced person. Mortars shall be mixed in strict accordance with manufacturer's instructions.

SUBMITTALS AND SAMPLE PANELS

Lay up 4'-0" x 4'-0" sample panels of each type of masonry and mortar (maximum of 3 panels for each type) as specified in Division 4. Correct or modify samples until suitable to and approved by Architect. Contractor shall submit to Architect in written form, exact proportions of mortar mix (es) including amount of color pigment, used on project.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver only new material to Project Site in original, unopened containers with manufacturer's brand name clearly marked thereon. Premixed masonry cement shall be approved by Architect.

Store materials under cover in a dry place. Cement, line and air-setting mortars shall be stored in watertight sheds with elevated floors. Material in bags showing evidence of water contact shall not be used.

ENVIRONMENTAL CONDITIONS

Do not lay masonry when outside temperature is below 40 degrees F. or is expected to be below 40 degrees F. within 24 hours after placement. If previous

conditions are anticipated and written approval to proceed has been obtained from the Architect, take following precautions:

Sand and mixing water shall be heated to product mortar temperature between 40 degrees F. and 120 degrees F. Maintain temperature of mortar on boards above freezing.

PART TWO - PRODUCTS

MATERIALS

PORTLAND CEMENT: ASTM C-150, Type I.

MASONRY CEMENT: ASTM C-91, Type II, non-staining for limestone.

HYDRATED LIME: ASTM C-207, Type S.

FINE AGGREGATE: Sand, ASTM C-144

WATER: Drinkable, from a public source.

ADMIXTURES: No air-entraining admixtures or cementitious materials containing airentraining admixtures shall be used in mortar. No anti-freeze compounds or other substances shall be used in mortar to lower freezing point. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar in which reinforcement, metal ties or anchors are imbedded.

DRYBLOCK ADMIXTURE: Add a dryblock mixture to mortar for water repellent qualities.

TYPE S MORTAR REQUIRED: All masonry wall installation.

MORTAR PIGMENT: Magnolia Mortar Mix or LoneStar Mortar Mix.

MIXES

Do not change source of mortar materials during course of work.

Do not combine methods of proportioning mortar types. Use same method for duration of project.

Waterproofing required for mortar in exterior building wall masonry only, including masonry back-up and face brick.

Unless specified otherwise, proportions are by volume. One sack of cement considered equal to one cubic foot.

TYPE N MORTAR: (ASTM-270 proportions by volume): One (1) part Portland Cement;. One (1) part Hydrated Lime; aggregate not less than 2 1/4 and not more than 3 times the sum of the volumes of the cement and lime used.

GROUT: One (1) part Portland Cement; 1/10 part hydrated lime; 3 parts sand; 2 parts size 3/8 inch gravel (ASTM C-404) and enough water to produce an 8 inch to 10 inch slump (per ASTM C-143) and 2500 psi compressive strength in 28 days. Provide Dryblock Admixture for water repellent qualities.

PART THREE - EXECUTION

Mortar mix may be varied with Architect's permission depending on weather conditions. Measure all ingredients in containers of known capacity. Do not measure by shovel fulls.

MIXING

Except as otherwise approved for small batches, do mixing in mechanically operated batch mixers of drum type in which water can be accurately and uniformly controlled. Allow at least 5 minutes mixing time, 2 minutes for mixing dry materials, 3 minutes for continuing mixing after water has been added. Do not permit volume of mixed materials per batch to exceed manufacturer's rated capacity of mixer drum in cu. ft. of mixed material. Empty drum completely before placing succeeding batch therein.

Mix cementitious materials and aggregate with amount of water consistent with satisfactory workability.

If mortar begins to stiffen from evaporation or from absorption of a part of mixing water, retemper mortar immediately by adding water and remixing. Use mortar with 2-1/2 hours of initial mixing. Do not use mortar after it has begin to set.

For mortar for grouting and poured fills increase water quantity to produce consistency required for pouring; stir continuously to prevent aggregate segregation.

POINTING GROUT: Prepare with as dry consistency as will produce grout sufficiently plastic to be worked into joints.

MIXING EQUIPMENT: Keep mixing equipment clean and free of set materials, to maintain a uniform quality in the mortar, and to preclude accelerating the set of subsequent batches. If there is a considerable lapse between mixing of each batch of mortar, partly fill mixer with water and leave it in operation.

INSTALLATION

Provide matching mortar from existing school @ new concrete units and face brick masonry work at new multipurpose building.

MASONRY GROUT & CONCRETE FILL REINFORCEMENT

Grout fill solid all pilaster, bond beams or lintel conditions as indicated on drawings.

END OF SECTION 04100

SECTION 04150 - MASONRY REINFORCEMENT & ACCESSORIES

PART ONE - GENERAL

DESCRIPTION

Provide masonry reinforcement and accessories as shown on drawings and specified herein.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Concrete Reinforcement: Section 03200
Mortars & Grout: Section 04100
Brick Masonry: Section 04210
Concrete Unit Masonry: Section 04220
Metal Fabrications: Section 05500

QUALITY ASSURANCE

Masonry reinforcement material shall meet requirements of the Southern Building Code Congress and the International Conference of Building Officials.

PRODUCT DELIVERY. STORAGE & HANDLING

Deliver, receive, store and handle materials in a manner to prevent damage. Replace all damaged items

PART TWO - PRODUCTS

MATERIALS

CONTINUOUS JOINT REINFORCEMENT

Prefabricated drywall type, manufactured of mill galvanized units, 14 gauge.

Provide continuous reinforcing at 16” o.c.vertically & horizontally each way for all masonry walls or as indicated on drawings.

ADJUSTABLE DRYWALL VENEER WALL TIES:

Hohmann & Barnard, Inc. – #DW-10-X (1”) w/ VWT – vee wall tie
Heckmann Building Products Inc. – Pos-I-Tie Self drilling screw (1”) w/triangle wire tie.

SINGLE WYTHE WALLS:
Hohmann & Barnard, Inc. – Truss reinforcement Truss-Mesh #120
Masonry Reinforcing Corp. – Truss type Series 300 single wythe (2 wire).

CAVITY WALLS:
Hohmann & Barnard, Inc. – Adjustable Eye-Wire Truss type #170 w/ rectangular adjustable wall ties
Masonry Reinforcing Corp. – Truss type Series 900 w/ rectangular adjustable wall ties.

COLUMN TIES @ CMU'S - Hohmann & Barnard, Inc. – #359F w/ rectangular adjustable wall ties #302W (Column Web Tie). Widths shall be determined by wall thickness.
Heckmann– #315B w/ rectangular adjustable wall ties #318.

COLUMN TIES @ BRICK - Hohmann & Barnard, Inc. – #359F w/ rectangular adjustable wall vee ties. Widths shall be determined by wall thickness.
Heckmann– #315B w/ rectangular adjustable wall vee ties #316.

WEEP HOLES:
Hohmann & Barnard – Round plastic #341 W/S
Masonry Reinforcing Corp. – Round plastic #2905 w/ wick & screen

CORNER AND TEE-JOINT REINFORCEMENT: Use prefabricated corner, and tee sections to form continuous reinforcement around corners and for anchoring abutting walls and partitions. Materials in corner and tee sections to correspond to type and design of joint reinforcement used or indicated on drawing details otherwise.

MORTAR NET:
Hohmann & Barnard – Mortar Trap (10" high x 4 ft long (1 ½" thick).

MASONRY GROUT & CONCRETE FILL REINFORCEMENT

STEEL REINFORCING BARS: Supplied in Section 03200.

CONTROL JOINT MATERIAL

RUBBER CONTROL JOINTS:
Hohmann & Barnard – #RS-Standard (RS-8 & RS-12) (Extruded rubber material)
Sandel Manufacturing – 2013 rubber control joint

PART THREE - EXECUTION

INSTALLATION

CONTINUOUS JOINT REINFORCEMENT

Install 16" o.c. vertically, full height of all concrete masonry walls and partitions and where shown on drawings. Install additional reinforcing as called for below:

Install in first bed joint immediately above and below openings and extend minimum 24" beyond each side of opening.

Install in bed joints of first and second courses below bearing line in bearing walls when wall receives uniformly distributed floor or roof load.

Do not lay joint reinforcement across vertical control or expansion joints.

Do not install joint reinforcement which is dirty or which has other coating which will reduce or destroy bond.

MASONRY GROUT & CONCRETE FILL REINFORCEMENT

STEEL REINFORCING BARS: Shall be placed in bond beams or pilasters as indicated on drawings. Reinforcing bars shall extend minimum of 7" beyond each side of openings. Support bars with galvanized metal bar positioners.

CONTROL JOINTS

Provide vertical control joints in masonry where shown on elevations. Control joints shall be same width as masonry joint width.

Install in accordance with manufacturer's recommendations.

ADJUSTABLE MASONRY WALLS TIES:

Screw attach adjustable wall ties to studs at 16" o.c. vertical and 16" o.c. horizontal or as shown on drawings.

END OF SECTION 04150

SECTION 04200 – UNIT MASONRY

PART ONE - GENERAL

DESCRIPTION

Provide brick masonry and stone veneer as shown on the drawings and specified herein.

Also included is the installing of items furnished under other sections such as bolts, anchors, nailing blocks, inserts, flashing, steel lintels expansion joints and reinforcing.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Concrete Reinforcement: Section 03200
Mortars & Grouts: Section 04100
Masonry Reinforcement and Accessories: Section 04150
Flashing & Sheetmetal: Section 07600
Sealants & Calking: Section 07900
Hollow Metal Doors & Frames: Section 08110

QUALITY ASSURANCE

Sample Panel: Lay up 4'-0" x 4'-0" sample panels of each type of brick and mortar (maximum of 3 panels for each type) as specified in Division 4. Correct or modify samples until suitable to and approved by Architect. Contractor shall submit to Architect in written form, exact proportions of mortar mix(es) including amount of color pigment, used on project. Demolish and remove from site after completion and final acceptance of brick work.

SUBMITTALS

Samples: Submit full size samples of face brick to show range of colors, textures, finishes and dimensions. For approved equal prior to bidding see Instructions to Bidders Article 3.3.

Certificates: Furnish manufacturer's certification that brick furnished meet or exceed requirements of this specification.

Manufacturer's Data: Furnish manufacturer's recommended brick cleaning agent and application procedure.

Store brick above ground on level platforms. Cover and store in approved manner which will protect them from contact with soil and from weather exposure. Do not use materials with stained faces in exposed work.

ENVIRONMENTAL CONDITIONS

Do not lay brick when air temperature is below 40 degrees F. or is expected to be below 40 degrees F. within 24 hours after placement.

If previous conditions are anticipated and written approval to proceed has been obtained from the Architect, take following precautions:

Sand and mixing water shall be heated to produce mortar temperature between 40 degrees F. and 120 degrees F. Maintain temperature of mortar on boards above freezing. Maintain an air temperature above 40 degrees F. on both sides of the masonry while masonry work is in progress and for a period of at least 48 hours after masonry work is completed.

During erection, keep walls dry by covering with a vapor barrier at end of each day, or during shutdown period. Covering to overhang at least 2'-0" on each side of wall and be anchored securely.

PART TWO - PRODUCTS

MATERIALS

FACE BRICK: All brick shall meet requirements of current ASTM Specifications C-216.

- Grade SW, Type FBS
- Size – Nominal
- Color – Selected by Architect.
- Style – Selected by Architect
- Allowance – Use Henry Paint Grade Brick that can be painted.

MORTAR: ASTM C-270-73, Refer to Section 04100.

CLEANING AGENTS: As recommended by brick manufacturer.

INSPECTION

Examine foundations to assure surfaces to support brick work are at proper grades and elevations and free of all dirt and deleterious material.

Verify that initial absorption rate of brick is within acceptable limits.

Verify all base and spandrel flashing as well as anchors and ties are properly installed.

Do not proceed with laying of brick until unsatisfactory condition have been corrected.

PREPARATION

BRICK: Thoroughly wet all brick with clean water 24 hours before placement. Brick shall be damp when laid.

ANCHORS, TIES AND REINFORCEMENT: Remove all dirt, ice, loose rust, and scale prior to installation.

INSTALLATION

Layout work in advance, finish at corners with not less than a half brick.

Lay brick in running bond plumb, true to line and with level courses accurately spaced within allowable tolerances. Install reinforcing, anchors, and ties as specified.

Use masonry saws to cut and fit exposed units. Trowel cuts not acceptable.

Do not install cracked, broken or chipped masonry units exceeding ASTM allowances.

Stop off horizontal run by racking back in each course; toothing is not permitted.

Adjust units to final position while mortar is soft and plastic.

If units are displaced after mortar has stiffened, remove, clean joints and units or mortar and relay with fresh mortar.

Adjust shelf angles to keep work level and at proper elevation.

Provide pressure relieving joints by placing a continuous 1/8” foam neoprene pad under the shelf angle.

When joining fresh masonry to set partially set masonry:

a: Remove loose brick and mortar.
b: Clean and lightly wet exposed surface of set masonry prior to laying fresh masonry.

Install all lintels, anchors and flashing at proper locations, specified elsewhere.

PROTECTION OF WORK

Protect all concrete floor slabs by covering with 11 mil. polyethylene and 2" thickness of sand or dirt prior to starting masonry work.

Protect sills, ledges and offsets from mortar drippings or other damage during construction.

Remove misplaced mortar to grout immediately.

Protect face materials against staining.

Protect the door jambs and corners from damage during construction.

MORTAR BEDS

Lay brick with full mortar coverage on horizontal and vertical joints in all courses. Do not furrow bed joints.

Provide sufficient mortar on ends of brick to fill head joints.

Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.

JOINTS

Joints shall be 3/8", concave and tooled with 5/8" diameter steel tool as soon as mortar has set.

Three brick and three joints shall equal 8" vertically.

The average width of any three consecutive joints shall be 3/8".

All exposed brick shall be laid in Running Bond Pattern unless noted otherwise.

Lay brick in soldier, header, rowlock and other patterns where shown on drawings.

Install 3/8" wide vertical control joints as indicated on drawings.

Space control joints not more than 20'-0" o.c. unless otherwise indicated.

Joints shall be in face brick wythe only, mortar-free and filled with sealant.

BUILT-IN WORK

Consult with other trades and make provisions that will permit installation of their work in manner to avoid cutting and patching. Build in work of other sections as necessary and as work progresses. Cutting and patching required for work of others to be done by masonry mechanics.

Provide outside joint around exterior door and window frames and other framed wall openings. Use removable wood strips to form joint 1/4" wide x 3/4" deep. Remove strip when masonry work is complete. Caulk under Section 07900.

Fill solid with grout all hollow metal door frames in masonry walls.

Set steel lintels in full beds of mortar. Lintels will be furnished under Section 05100: STRUCTURAL STEEL.

Build in flashing and reglets occurring in masonry. Flashing and reglets will be furnished under Section 07600: FLASHING AND SHEETMETAL.

Build in control joints as shown on drawings.

Keep space open with temporary filler for expansion joints.

Coordinate installation of rigid insulation in cavity wall.

Coordinate installation of waterproofing and damp proofing of exterior face of interior wythe of all exterior walls to receive mastic specified in Section 07110.

CHASES

Leave necessary opening for passage of pipes, drains, ducts, wires and utility lines. Form chases shown, required or directed. Do not proceed until extent and location of openings and chases required by other trades has been determined. At completion of work of other trades, return and solidly close openings. Before closing up pipe, duct or similar inaccessible spaces or shafts, remove rubbish and sweep out area.

WEEPHOLES

Where exterior wythe of cavity wall is supported by concrete, steel angles or where spandrel flashings are built into wall, form weepholes in mortar bed on which first course of masonry is to be placed. Space weepholes not over 32" o.c. Keep weepholes free of mortar and other obstructions.

CUTTING & PATCHING

Provide all chases, holes, etc., needed for Mechanical Contractors and Electrical Contractors. All work to be done by masonry mechanics.

REGLETS

Where steel columns are in close proximity to masonry, provide clean, true reglets to receive angles or fins. Reglets shall be constructed to allow for free movement of metal fins. Where masonry abuts structural steel, provide allowance for expansion. Install all masonry insert reglets furnished under other sections of this specification.

LOOSE LINTELS: Of sizes shown or required, minimum 8" bearing on each side of masonry opening. U-block lintels minimum bearing 8" on each side of concrete masonry opening.

POINTING & CLEANING

Cut out any defective joints and holes in exposed masonry and repoint with mortar.

Dry brush masonry surface or clean with dry burlap after mortar has set at end of each days work and after final pointing.

Clean exposed unglazed masonry with stiff brush and clear water.

If cleaning by water does not produce satisfactory results, apply approved cleaning agent to same area, following manufacturer's recommendations.

When results are acceptable to Architect, complete cleaning of masonry.

Protect sash, metal lintels and other materials which may corrode when masonry is cleaned with acid solution.

Leave work area and surrounding surfaces clean and free of mortar spots, droppings and broken masonry.

END OF SECTION 04200

SECTION 05100 - STRUCTURAL STEEL

PART ONE - GENERAL

DESCRIPTION

Work included: Furnish, fabricate, mark for erection identification, pack, crate, erect, or otherwise properly prepare for shipment, and ship to the site all structural steel columns, beams, angles, anchor bolts, erection bolts, nuts, welding electrodes and other miscellaneous items required for structural steel frame, miscellaneous metal items or indicated on the Drawings, described in these Specifications, or otherwise required for proper completion of work.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions
Testing Laboratory Services: Section 01400
Open-Web Steel Joists: Section 05200
Metal Fabrications: Section 05500

STANDARD

The AISC Specification for Design, Fabrication and Erection of Structural Steel for Buildings shall govern the work. Welding shall be in accordance with AWS Code DI .1 High strength bolting shall be in accordance with AISC Specification for Structural Joints Using ASTM A-325 or A-490 Bolts.

SUBMITTALS

SHOP DRAWINGS: Shall include all shop and erection details, and members and connections for any portion of the structure not shown on the contract drawings shall be detailed by the fabricator and indicated on the shop drawings. All welds shall be indicated by standard welding symbols of the AWS.

CERTIFICATION: Certified copies of mill test reports including names and locations of mills and shops, shall be furnished for all structural steel.

RESPONSIBILITY FOR ERRORS: The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members.

QUALIFICATION OF WELDERS: Certification that each welder is qualified in accordance with AWS Code DI .1 shall be provided. Any welder shall be retested and recertified when the work of the welder creates a reasonable doubt as to his proficiency. Tests, when required, shall be conducted at no additional expense to the Owner. Recertification of the welder shall be

submitted only after the welder has taken and passed the required retest.

PRODUCT HANDLING

Material shall be stored out of contact with the ground in such a manner and location as will minimize contamination and deterioration.

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART TWO - PRODUCTS

MATERIALS

STRUCTURAL STEEL: ASTM Specification A-36 or A992.

STRUCTURAL TUBING: ASTM Specification A-500, Grade B

STEEL PIPE: ASTM Specification A-53, (Type E) (Type S), Grade B.

PAINT: Tnemec 10-99; Southern Coatings RIP 1-0988.

HIGH-STRENGTH BOLTS, (including nuts and washers): ASTM Specification A-325 or A-490.

BOLTS AND NUTS, (other than high-strength): ASTM Specifications A-307, Grade A.

PLAIN WASHERS, (other than those in contact with high-strength bolt heads and nuts): ANSI Standard B 18.22.1, type B.

STEEL CASTINGS: Comply with ASTM A27, Grade 65-35, medium-strength carbon steel.

ANCHOR BOLTS: Comply with ASTM A307, non-headed type with heavy hexagonal nuts unless otherwise indicated.

UNFINISHED THREADED FASTENERS: Comply with ASTM A307, Grade A, regular low-carbon steel bolts and nuts. Provide either hexagonal, or square, head and nuts, except use only hexagonal units for exposed connections.

ELECTRODES FOR WELDING: Comply with AWS Code, using ASTM A233 E-70 series electrodes.

Provide templates for precise location of anchor bolts and other items embedded in concrete foundations.

FABRICATION

Structural steelwork material shall be in accordance with the applicable provisions of the AISC Specification. Fabrication and assembly shall be done in the shop to the greatest extent possible.

Structural steelwork, except surfaces of steel to be encased in concrete surfaces to be field welded, shall be prepared for painting in accordance with the AISC Specification and primed with paint materials heretofore listed.

Bolts and washers of all types and sizes required shall be provided for completion of all field erection.

HIGH-STRENGTH BOLTED CONSTRUCTION: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts", using A325N bolts unless noted otherwise.

WELDED CONSTRUCTION: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welded work.

Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

Provide holes required for securing other work to structural steel framing, and for the passage of other work through steel framing members, as shown on the Final Shop Drawings. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.

Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

SHOP PAINTING

Shop paint all structural steel work, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on the exposed portions and the initial 5 cm (2") of embedded areas only. Remove loose rust and mill scale by Hand Tool (SSPC-SP2) or Power Tool (SSPC-SP3) method. Prime with Tnemec 10-99 or Southern Coating RIP 1-0900 primer to minimum 2 mil dry thickness. See erection for field touch-up of primer.

PART THREE – EXECUTION

INSPECTION: Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to proper execution of the work. Do not proceed until unsatisfactory conditions have been corrected.

PREPARATION: Clean concrete and masonry bearing surfaces free from bond-reducing materials, and then roughen to improve bond between bearing surfaces. Clean the bottom surfaces of base and bearing plates._

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FABRICATION

Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

Furnish templates and other devices necessary for presetting bolts and other anchors to anchorage locations.

Bases and bearing plates shall be shop-welded to columns and members attached to concrete and masonry. Install slide-bearing plates and protect against damage in accordance with manufacturer's written directions.

Splice members only where indicated unless, with the Architect's approval, splices not indicated would result in lower costs due to reduced shipping costs. Submit structural calculations signed by a structural engineer licensed in the State of Louisiana, for all splices not indicated.

Do not use gas cutting torches for correcting fabrication errors in the structural framing. Cutting will be permitted only on secondary members as acceptable to the Architect. Finish gas-cut sections equal to a sheared appearance with gas-cutting permitted.

ERECTION

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.

Remove temporary connections and members when permanent members are in place and final connections are made.

Provide temporary planking and working platforms as needed for effective completion of the work of this Section.

Install anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

Clean concrete and masonry bearing surfaces free from bond-reducing materials, and then roughen to improve bond to surface. Clean the bottom surface of base and bearing plates. Set loose and attached base plates for structural members in wedges or other adjusting devices. Tighten anchor bolts after the supported members have been positioned and plumbed. Do no remove wedges or shims but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout. Pack grout solidly between surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer' s instructions as approved by the Architect.

Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before fastening permanently. Clean the bearing surfaces and other surfaces which will be permanent contact before assembly. Perform necessary adjust for discrepancies in elevations and alignment. Level and plumb individual members of the structure within specified AISC tolerances.

Establish required leveling and plumbing measurements on the mean operating temperature of the structure. Make allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.

All ASTM A325 bolts in structural connections shall be tightened using the "turn-of-the-nut-method" or Calibrated Wrench Method" as required by AISC "Structural Joints using ASTM A325 or A490 Bolts."

Slip joint bolts shall be tightened to a "snug fit" only and bolt threads burred or tack-welded to prevent loosening. Coat slip joint surfaces in contact with grease prior to bolt tightening.

FIELD TOUCH-UP: Inspect shop paint coat and touch up abrasions and paint all field welds to same standard as shop paint.

FIELD QUALITY CONTROL

HIGH-STRENGTH BOLT TEST: The testing and inspection agency shall inspect high-strength bolted connections and shall visually inspect field-welded connections, and shall prepare test reports for the Architect's review. The testing agency shall conduct and interpret the tests and shall state in each report whether the inspected work complies with the requirements and shall specifically state all deviations there from.

Ten (10%) percent of bolted connections shall be randomly selected for inspection by inspection

agency. Agency shall tighten one bolt by “Turn of the nut method” or Calibrated Wrench Method” as required by AISC “Structural Joints Using A325 or 490 Bolts.” The torque required to move this nut shall be used as the standard for the remainder to be tested. Movement of other test nuts before standard torque is reached shall constitute failure. If 5% of all nuts tested fail, then Contractor shall be required to test 100% of all high-strength bolts in all connections. All nuts and bolts failing shall be retightened and retested.

FIELD WELDING TESTS: All field welding shall be performed by “certified” welders. The Owner shall pay for all welding tests. A total of eight (8) shop welds shall be tested by “x” ray or ultrasonic, by an independent testing laboratory. A total of ten (10) field welds shall be tested by the ultrasonic or “x” ray method. If 10% of the tests are below 90% of that called for, all welds shall be tested and rewelded where required and retested until all welds pass.

CORRECTION: Correct deficiencies in structural steel work which inspections and test reports have indicated to be not in compliance with the specified requirements. Perform all additional tests required to reconfirm non-compliance of the original work and to show compliance of corrected work.

CLEAN-UP: Remove from the site and legally dispose of debris and waste materials resulting from operations under this section of the specifications.

END OF SECTION 05100

SECTION 05500 – METAL FABRICATIONS

PART ONE – GENERAL

DESCRIPTION

Provide metal fabrications as shown on drawings and specified herein.

WORK INCLUDES:

Items shop fabricated from stock sections and miscellaneous factory-made metal items furnished under this Section but installed under other Sections. The schedule shows kinds of items included in this Section but installed under other Sections. The schedule shows kinds of items included in this Section but is not intended as a complete listing. Items described are generally those items not detailed on drawings, or if detailed, required amplification. Consult drawings for full extent of work required under this Section.

Providing and setting structural shapes, such as angles, channels, or plates shown to be built-in or anchored into concrete for attachment of other work.

Providing all anchors, sleeves, screws, bolts and connecting members necessary for securing metal work to other adjacent or adjoining work.

Providing and installing angles, lintels, and other reinforcement.

Furnish and install all metal handrails indicated on Drawings.

Furnishing all necessary patterns and templates.

Furnishing to various trades, where needed, sockets, anchors, and other portions of this work that are to be built into structure, and supervising and being responsible for their accurate spacing and setting.

RELATED WORK SPECIFIED ELSEWHERE

General & supplementary Conditions, Special Requirements
Hangers & Supports for Plumbing Work: Division 15
Hangers & Supports for HVAC Work: Division 15
Hangers & Supports for Electrical Work: Division 16

QUALITY ASSURANCE

Materials shall be best of their kind for purpose intended. Materials not specifically described shall be manufacturer's standard for first quality.

SUBMITTALS

Submit shop drawings showing gauges, thicknesses, sizes and construction of members and manner assembling various members which make up different items. Show true profiles, connections and relationship to adjoin work, methods of anchoring, and other pertinent information.

JOB CONDITIONS

Coordinate with trades furnishing items, which will attach to built-in members for proper positioning.

Furnish in ample time; anchors, bolts, inserts, clips and other items furnished under this Section but built in with work of other trades.

No work shall be fabricated or delivered to site until shop and detail drawings for the work have been approved.

PART TWO - PRODUCTS

MATERIALS

STEEL: ASTM A36 unless indicated otherwise on drawings.

GALVANIZING OR ZINC COATING: ASTM A123 or A386 as applicable and observing precautions in ASTM Recommended Practices A384 and A385.

PAINT FOR SHOP APPLICATIONS: Prime with Tnemec 10-99 or Southern Coatings RIP 1-0900 primer to minimum 2 mil dry thickness.

FABRICATION

Form metals to shape and size, with sharp lines and angles, and with smooth surfaces and faces. Shearing and punching shall leave clean true lines and surfaces, free from distortion. Weld or bolt permanent connections with bolts in finished work countersunk. Do not use screws unless specifically shown or required. If used, they shall be countersunk stainless steel or metal compatible with members being joined. Mill fastenings to a close fit. Provide necessary rabbets, lugs and brackets, etc., so work can be assembled neatly. Thickness of metals and

details of assembly and supports shall provide ample strength and stiffness. Built-up parts shall be out of wind. Form joint exposed to weather to exclude water. Countersink and recess to receive hardware. Provide with proper bevels and clearances.
Use plug welds wherever practicable in work exposed to view. Use fillet welds only where plug welding is impractical. Where welds are exposed flush and smooth, level with adjacent surfaces so that resultant weld provides appearance and strength of a continuous member of uniform thickness. Grind welds at intersecting members to straight lines.

CLEANING STEEL: Remove loose rust and mill scale by Hand Tool (SSPC-SP-2) or Power Tool (SSPC-SP3) method.

PRIME FERROUS METAL: Do not shop galvanized items. Apply 2 shop coats to parts of miscellaneous items which will be inaccessible after assembly.

Where two coats of primer are required, tint second coat a recognizable different shade. Before shipment, clean and touch up welds and abrasions on galvanized items with zinc-rich paint.

PART THREE - EXECUTION

INSPECTION

Inspect, field measure and verify that conditions are acceptable for installation of work.

INSTALLATION

Erect metal items in proper position, securely fastened, plumb, in line, and level, free of sharp edges and rough spots and in accordance with approved shop drawings.

Do cutting, drilling, or modifying of adjacent or adjoining work where necessary for proper installation.

Set hardware that is shop-installed. Do fitting true to line.

Bend or form tubing, pipe and other members to continuous and true curves, with joints flush, hairline, neatly fastened together and assembled to other materials.

Touch up abrasions and metal cuts, bolts and nuts with material used for shop priming so that entire assembly as erected presents a complete smooth prime coat

of paint.

SCHEDULE OF FABRICATIONS

LOOSE LINTELS: Of sizes shown or required, minimum 8" bearing on each side of masonry opening. Lintels furnished under this Section but installed under Masonry: Division 4. U-block lintels minimum bearing 8" on each side of concrete masonry opening.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

PART ONE - GENERAL

DESCRIPTION

Provide rough carpentry required to complete the work, including, but not limited to:

Studs, joists, headers, bracing, supports and shoring required to support construction during formative stages.

Forming block-outs and setting inserts into concrete to accommodate fastenings.

Framing openings in and providing forming and supports for concrete lintels in concrete and masonry.

Providing all nailers, wood blocking and plywood in connection with metal decks, copings, roofing's and fascias.

Installation of metal door frames.

Providing openings, nailers, furring and grounds for items specified in other sections and indicated on drawings.

Installing blocking and concealed back-up for grab bars and handrails. Installing anchors, inserts, fasteners and other items furnished under other sections.

Coordinating and framing as required for installation and support of Plumbing, Heating, Ventilating, Air Conditioning and Electrical work.

Furnishing and setting of all rough hardware, such as shoes, dogs, spikes, bolts, stirrups, nails, lag screws, lagging bolts, anchors, etc., as indicated or required to hold woodwork together or to anchor or secure it to other materials and construction.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Concrete Formwork: Section 03100
Finish Carpentry: Section 06200
Hollow Metal Frames: Section 08110
Painting: Section 09900
Miscellaneous Specialties: Division 10

QUALITY ASSURANCE

Lumber Grading rules and Wood Species to be in conformance with American Softwood

Lumber Standard PS2O.

Grading rules of following associations apply to materials furnished under this Section:

Southern Pine Inspection Bureau (SPIB)
Western Wood Products Association (WWPA)
Softwood Plywood-Construction and Industrial PSI

Each piece of lumber and plywood shall have grade marked by association having jurisdiction under whose grading rules it is produced.

Preservative Treatment: AWPB Standards LP-2, above ground use.

Fire Hazard Classification: Underwriters' Laboratories, Inc., for treated lumber and plywood.

SUBMITTALS

PRESSURE TREATED WOOD: Submit certification by treating plant stating chemicals and process used, net amount of salts retained, and conformance with applicable standards.

PRESERVATION TREATED WOOD: Submit certification for water-borne preservative that moisture content was reduced to 19% maximum, after treatment.

PRODUCT DELIVERY, STORAGE AND HANDLING

Immediately upon delivery to job site, place materials in area protected from weather.

Store materials a minimum of 6" above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.

Do not store seasoned materials in wet or damp portions of building. Protect sheet materials from corner breaking and damaging surfaces, while handling.

MATERIALS

LUMBER

Dimensions indicated and specified are nominal. Actual sizes to conform to N.B.S. PS20. Where dimensions are not indicated, sizes to be selected to meet structural requirements of strength and stiffness, subject to approval of Architect. End jointed lumber not acceptable.

MOISTURE CONTENT: 19% Maximum for air-dried stock.

SURFACING: Surface four sides. (S4S).

LUMBER GRADES: No. 2 grade or better Southern Pine or Douglas Fir standard grade.

PLYWOOD

GENERAL: Identify each panel with appropriate grade-trademark of American Plywood Association. Thickness as indicated on drawings. If none indicated, thickness shall be as required for span and loading.

EXTERIOR USE: N.B.S. PS 1 plywood, Construction, Group I, CD with exterior glue.

INTERIOR USE: CD grade.

OTHER MATERIALS

BUILDING PAPER: Asphalt-saturated felt; ASTM D226, No. 15 non-perforated.

PRESERVATIVE TREATED WOOD: Water-borne salt preservatives, AWPB LB-2,above ground application. Each piece to bear mark identifying treatment. “Osmose K-33” manufactured by Osmose Wood Preserving Co., Buffalo, N.Y., or Wolmanized” by Koppers acceptable.

ROUGH HARDWARE

Provide rough hardware, including nails, screws, bolts, anchors, ties and metal fastenings as required for proper construction and erection of work, or proper type and size suitable for purpose intended and approved by Architect.

PART THREE – EXECUTION

INSPECTION

Verify that surfaces to receive rough carpentry materials are prepared to required grades and dimensions.

Do not proceed until all unsatisfactory conditions are corrected.

PREPARATION

Verify that all items requiring priming are painted before installation.
Verify correct location of pre-set anchor bolts and other features

Verify locations and sizes of openings required by other sections of the specifications.

Verify locations of blocking and reinforcement for grab bars, handrails, and any other specialty item included in Division 10.

INSTALLATION

FRAMING: Studs, openings, blocking, rough bucks, nailers, grounds, furring and back-up for items furnished under other sections in accordance with manufacturer's recommendations and approved shop drawings.

Lay out, cut, fit and erect other rough carpentry as indicated on drawings and required.

Brace, plumb and level members in true alignment and rigidly secure in place with sufficient nails, spikes, screws and bolts as necessary.

BLOCKING: Install blocking to provide rigid and secure backing as detailed and necessary.

Wedge, align, and anchor blocking with countersunk bolts, washers and nuts or nails.

Locate blocking to facilitate installation of finishing materials, fixtures, specialty items and trim.

Install 2x blocking halfway between bottom & top plates of all load bearing and fire rated walls.

FURRING: Provide headers and other nailing members within furring framework. Install and shim furring to provide faces true to line and plumb.

ROUGH BUCKS: Provide rough wood bucks for all openings as indicated and required.
Securely anchor in place with 3/8" bolts and washers at 36" o.c. max. and 6" max. from ends.
Countersink bolt heads as required or indicated.

GROUNDS: Provide grounds as indicated and required including those for Mechanical and Electrical ceiling and wall items.

NAILERS ON MASONRY OR STEEL: Anchor nailers resting on masonry or steel with 3/8" bolts and washers at 36" o.c., unless indicated otherwise. Countersink bolt heads as required or indicated.

FASTENINGS TO CONCRETE OR MASONRY: Use power-actuated steel nails, expansion screws, toggle bolts, metal plugs, or metal inserts for installation or rough carpentry members to masonry or concrete construction.

Do not use wood plugs or nailing blocks for fastening grounds, or furring to concrete or masonry.

MASONRY OPENINGS: Wood centering or other necessary supports for openings in masonry walls shall be accurately and strongly made, properly braced and secured into position until masonry has thoroughly set.

TEMPLATES AND MEASURING BOXES: Provide all necessary templates and measuring boxes as required.

PRESERVATIVE-TREATED WOOD PRODUCTS: Provide preservative-treated wood in following locations:

All lumber used in exterior wall or other exterior construction.

All plywood used in exterior construction.

All lumber used in connection with concrete, masonry or steel.

All wood used in roof construction including fascia backup, cants, nailers and runners at mechanical units.

Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

PROTECTION

Protect masonry and concrete subject to damage during work, including edges of sills, concrete slabs, concrete steps, platforms and similar items, remove such protective covering when directed.

CLEAN-UP

Pick up cuttings and debris normal to this operation daily and store in areas safely removed from the building or in fire-proof containers.

END OF SECTION 06100

SECTION 06176 – METAL PLATE CONNECTED WOOD TRUSSES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes wood roof, and floor trusses and truss accessories.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for roof sheathing and subflooring and dimension lumber for supplementary framing and permanent bracing.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. WCLIB - West Coast Lumber Inspection Bureau.
2. WWPA - Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

1.5 SUBMITTALS

A. Product Data: For metal-plate connectors, metal framing anchors, bolts, and fasteners.

B. Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice

details; type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm and stamped by a Utah Professional Engineer..

D. Qualification Data: For metal-plate manufacturer, professional engineer, fabricator, and Installer.

E. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Metal-plate connectors.
2. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Source Limitations for Connector Plates: Obtain metal connector plates through one source from a single manufacturer.

C. Comply with applicable requirements and recommendations of the following publications:

1. TP1 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

D. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with TPI recommendations to avoid damage and lateral bending. Provide for

air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Connector Plates:

   a. Alpine Engineered Products, Inc.
   b. CompuTrus, Inc.
   c. Eagle Metal Products.
   d. Jager Industries, Inc.
   e. Mitek Industries, Inc.
   f. Robbins Engineering, Inc.
   g. TEE-LOK Corporation.
   h. Truswal Systems Corporation.

2. Metal Framing Anchors:

   a. Alpine Engineered Products, Inc.
   b. Cleveland Steel Specialty Co.
   c. Harlen Metal Products, Inc.
   d. KC Metals Products, Inc.
   e. Silver Metal Products, Inc.
   f. Simpson Strong-Tie Company, Inc.
   g. Southeastern Metals Manufacturing Co., Inc.
   h. United Steel Products Company, Inc.

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of the following grade and species:

1. Grade for Chord Members: As indicated.
2. Species: Douglas fir-larch; WCLIB or WWPA.

2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1 from metal complying with requirements indicated below:

B. Hot-Dip Galvanized Steel Sheet: ASTM A 653, G60 coating designation; Designation SS, Grade 33, and not less than 0.036 inch thick.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, 80Z coating designation; ASTM A 570, Structural Steel (SS), Grade 33, and not less than 0.047 inch thick.

D. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, AZ50 coating designation; Structural Steel (SS), Grade 33, and not less than 0.036 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1..

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.5 METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. Before installing, splice trusses delivered to Project site in more than one piece.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

I. Install wood trusses within installation tolerances in TPI 1.

J. Do not cut or remove truss members.

K. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 06176

SECTION 06200 - FINISH CARPENTRY

PART ONE - GENERAL

DESCRIPTION

Provide finish carpentry required to complete the work indicated on the drawings and specified herein, including, but not limited to:

Furnishing and installing metal items such as angles, braces, lintels, clips, plates and stiffeners required in construction and installation of millwork items and cabinetwork.

Installing finish hardware specified in Section 08710.

Installing doors specified in Division 8 except aluminum entrance doors.

Installing miscellaneous specialty items specified in Division 10 and shown on drawings.

Setting and installing grilles, register faces and like items applied to woodwork.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Rough Carpentry: Section 06100
Hollow Metal Doors: Section 08110
Finish Hardware: Section 08710
Back-priming and Painting: Section 09900
Specialty Items: Division 10

OUALITY ASSURANCE

All millwork shall conform to the “Quality Standards” of the Architectural Woodwork Institute, latest edition for “Custom” Grade Work unless specifically indicated otherwise.

Following grading rules and standards, latest edition, apply to materials furnished under this Section:

LUMBER:
Southern Pine Inspection Bureau (SPIB)
Western Wood Products Association (WWPA)

National Hardwood Lumber Association (NHLA)

PLYWOOD:
Softwood Plywood: PS 1
Hardwood Plywood: PS5 1

PARTICLE BOARD: CS236

HIGH PRESSURE PLASTIC LAMINATE: NEMA Publication LD3

SUBMITTALS

Submit shop drawings for all millwork, identified with location, quality grade, type of finish and species of wood.

Show millwork in related and dimensional position and furnish large scale sections and details.

The drawings shall indicate all types of fastening and anchoring devices.

The mill shall be responsible for details and dimensions not controlled by job conditions.

Show all required field measurements beyond control of the mill.

The Contractor shall verify that all items will clear all obstructions between millwork shop and final location on job. Should any items as designed and detailed on drawings not clear all obstructions, Contractor shall so notify Architect in writing when shop drawings are submitted for Architect's review.

PRODUCT DELIVERY, STORAGE AND HANDLING

Do not deliver millwork in foggy or rainy weather.

Store millwork off the ground and properly supported in ventilated, weather-tight enclosure to prevent damage by excessive changes in moisture content.

Handle millwork in manner to prevent damage.

Receive, store and be responsible for finish hardware from time received until project is accepted. Check hardware when delivered for agreement with hardware schedule and promptly report errors or discrepancies to architect.

Store hardware off floor in weather-tight enclosure and handle in manner to prevent damage.

PART TWO - PRODUCTS

MILLWORK QUALITY GRADE

Materials and Fabrication: Custom grade for all finishes, unless specifically indicated otherwise, in accordance with "Quality Standards Illustrated" of the Architectural Woodwork Institute, latest edition, conforming to the following sections:

Section 100 - Solid wood members.
Section 200 - Plywood and particle board (no Fiberboard shelving permitted).
Section 300 - Standing and running trim.
Section 600 - Closet and storage shelving (no Fiberboard shelving permitted).

MATERIALS

PARTICLE BOARD: Mat-formed wood particle board, 45# density, CS236.

FASTENERS AND ANCHORING DEVICES: Of types and sizes appropriate for specific work. All exterior fasteners shall be non-ferrous. "Tapcon" masonry and concrete anchors, products of Buildex, shall be installed in accordance with manufacturer's recommendations.

HARDBOARD: PS58, tempered, 1/4" thick unless indicated otherwise.

INTERIOR WOODWORK: Grade marked WWPA, B and better, Piranha Pine.

INTERIOR PLYWOOD: 3/4" thick unless noted otherwise. Select white birch one piece face. Interior type A-A, where both sides will be exposed to view. Interior type A-B, where only one side will be exposed to view. Hardwood edgebands exposed to view

PLASTIC LAMINATE: General purpose 1/16" thick, color as selected by Architect, as manufactured by Nevemar or Formica Corp. Co. Selected from standard wood grains, patterns, & color grid system.

CABINET WORK:

.1 - All cabinet exposed faces: select white birch one piece face. Conform to Section 400 AWI custom standards.

.2 - Interior fixed shelving at all cabinets - 3/4" A-B fir paint grade.

.3 - Cabinet doors and drawers - select white birch one piece face. Hardwood Edge molding to match wood face of cabinet.

.4 - Cabinet backs - 1/4" plywood.

.5 - Cabinet sides and bottoms - 3/4" plywood. Sides exposed to view shall be 3/4" select white birch one piece face.

.6 - Drawer bottoms - 1/4" plywood.

.7 - Drawer sides - 3/4" plywood.

CABINET HARDWARE:

.1 - All drawers to have KV 1300 type drawer slides.

.2 - All door and drawer pulls and door hinges as specified under Section 06402.

EXPOSED SHELVING AND DIVIDERS:

Interior type plywood, select white birch one piece face, and white birch edge strip on front edge. 3/4" thick.

UNEXPOSED SHELVING (CLOSETS AND STORAGE ROOMS):

Interior type, grade A-B fir 3/4" thick.

FABRICATION

Fabricate millwork in accordance with "Quality Standards Illustrated" of AWI, 1968 edition, "custom" standards.

Support interior shelves on securely fastened continuous cleats or as indicated. (Adjustable standards recessed in stiles or casework sides.)

1 - Drive all power driven "T" head nails or staples where permitted on exposed surfaces with long dimension parallel with the exposed grain.

Install built-in hardware, hinges, pulls, knobs, slides and catches as specified under this section and Finish Hardware.

Install and prepare wood that would normally be exposed to view to properly receive finish as specified. Thoroughly sand after edgebanding to receive unified stained finish.

PART THREE - EXECUTION

INSPECTION

Examine all surfaces and materials to which finish carpentry items are to be applied.

Insure that surfaces and conditions of all materials to receive finish carpentry work are satisfactory to obtain specified results.

Verify that door frames are plumb, level, square, straight and aligned. Insure that all hardware provisions conform with approved shop drawings.

Do not proceed until all deficiencies are corrected.

PREPARATION

Verify that all wood trim and built-in millwork and cabinetwork surfaces, which will be concealed after installation, are back-primed before installing.

INSTALLATION

Install millwork and cabinetwork in a manner consistent with the quality of the specified grade and in accordance with approved shop drawings.

MILLWORK:

Finished woodwork shall be properly framed, closely fitted and accurately set to required lines and levels and rigidly secured in place.

Millwork shall be carefully put up, in the best and most rigid manner, straight, plumb level and in true alignment, neatly and accurately fitted arid scribed. Miters or other fitted joints shall be planed and sanded.

Nail and screw heads exposed in the work shall be countersunk, except where nature or thickness of wood does not permit. Work shall be left clean and free from warp, twist, open joints and other defects. Neatly scribe around pipes and other obstructions to fit work, and furnish and install fillers as necessary.

Cutting and repairing of this work for accommodation of the work of others shall be done as part of the work of this section unless otherwise specified.

Make joints in woodwork tight, formed to conceal shrinkage. Interior corners shall be coped, and external angle joints shall be mitered. Make joints on the miter except where shown to be butt-jointed, in which case use an approved device to prevent separation.

Make the minimum number of splices in running finish, beveled and jointed where solid fastening can be made. Butt joints in running finish will not be permitted.

Sink nail heads in finished work with a nail set. Nails and screws where possible, shall be concealed. Nails shall be blind-nailed wherever possible; otherwise, nailing shall be located and driven so as not to be visible in finish. Countersink face screws and plug with matching wood.

Metal items exposed in finished work shall be smooth, without burrs or irregularities. Screws or bolts shall be countersunk.

CABINETWORK:

All anchors and fasteners for cabinet shall be concealed.

DOORS:

Field fit and hang wood, plastic faced and hollow metal doors.

FINISH HARDWARE:

Fit hardware prior to application of painter's finish, remove during finishing operation and reset after completion of finish.

Protect metal knobs and handles by wrappers of tough paper or cloth maintained in place until acceptance of work. Take care not to mar or damage other work. Locate and position in accordance with Architect's directions. Upon completion of work, in presence of Architect, show that hardware works freely.

In setting thresholds, drill as necessary for fastening and set thresholds in full beds of oleo-resinous caulking compound.

MISCELLANEOUS SPECIALTY ITEMS:

Install specialty items in accordance with approved shop drawings. Verify all

locations and elevations prior to installing.

Fasteners shall be recommended and/or provided by manufacturer of item and entirely suited for purpose.

HIGH PRESSURE PLASTIC LAMINATE:

Install in strict accordance with manufacturer's printed instruction and approved shop drawings.

PROTECTION OF WORK

Provide suitable protection for finished work and material. Replace or repair to Architect's approval all damaged work at no cost to Owner.

END OF SECTION 06200

SECTION 06652 - QUARTZ / GRANITE SURFACE FABRICATIONS

PART 1 — GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following horizontal and trim quartz surface product types:

1. Countertops with or without undermount bowls
2. Reception areas/nurses stations
3. Vanity tops
4. Tabletops
5. Bar tops
6. Seats
7. Cold cafeteria surfaces
8. Hot cafeteria surfaces
9. Windowsills
10. Interior steps

B. Related Sections include the following:

1. Division 1 Section “LEED Requirements” for additional LEED requirements.
2. Division 5 Section “Metal Fabrications” for Blocking.
3. Division 6 Section “Rough Carpentry” for Blocking.
4. Division 6 Section “Solid Surface Fabrications.”
5. Division 9 Section “Solid Surface Wall Cladding.”
6. Division 9 Section “Quartz Surface Wall Cladding.”
7. Division 10 Section “Quartz Surface Toilet Partitions.”
8. Division 15 Section “Plumbing Fixtures.”
9. Division 16 Section “Wiring Devices.”

C. Alternates:

1. Refer to Division 1 Section “Alternates” for description of work in this Section affected by alternates.

1.3 SUBMITTALS

A. Product data:

1. For each type of product indicated.

B. Shop drawings:

1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
    a. Show the following:
        1) Full-size details, edge details, attachments, etc.
        2) Locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
        3) Locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in quartz surface.
        4) Seam locations.

C. Samples:
1. For each type of product indicated:
    a. Submit minimum 6-inch by 6-inch sample in specified color.
    b. Cut sample and seam together for representation of seaming techniques.
    c. Indicate full range of color and pattern variation.
2. Approved samples will be retained as a standard for work.

D. Product data:
1. Indicate product description, fabrication information and compliance with specified performance requirements.

E. LEED Submittals:

1. Credits MR 5.1:
    a. Product data indicating that materials are regionally manufactured and within 500 miles of the project site.

F. Product certificates:
1. For each type of product, signed by product manufacturer.

G. Fabricator/installer qualifications:
1. Provide copy of certification number.

H. Manufacturer certificates:
1. Signed by manufacturers certifying that they comply with requirements.

I. NSF/ANSI standards:
1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone — all food types.

J. Maintenance data:
1. Submit manufacturer's care and maintenance data.
    a. Maintenance kit for finishes shall be submitted.
2. Include in project closeout documents.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Fabricator/installer qualifications:
1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
1. Standards of the following, as referenced herein:
a. American National Standards Institute (ANSI)
b. American Society for Testing and Materials (ASTM)
c. National Electrical Manufacturers Association (NEMA)
d. NSF International
2. Fire test response characteristics:
a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E 84) or another testing and inspecting agency acceptable to authorities having jurisdiction.
b. Flame Spread Index: 25 or less.
c. Smoke Developed Index: 450 or less.

D. Allowable tolerances:
1. Variation in component size: ±1/8" (3 mm) over a 10' length.
2. Location of openings: ±1/8" (3 mm) from indicated location.
3. Maximum 1/8" (3 mm) clearance between quartz surfaces and each wall.

E. Coordination drawings:
1. Shall be prepared indicating:
a. Plumbing work.
b. Electrical work.
c. Miscellaneous steel for the general work.
d. Indicate location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.
2. Content:
a. Project-specific information, drawn accurately to scale.
b. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in

conflict with submitted equipment and minimum clearance requirements.

d. Provide alternate sketches to designer for resolution of such conflicts.

1) Minor dimension changes and difficult installations will not be considered changes to the contract.

3. Drawings shall:
   a. Be produced in 1/2" scale for all fabricated items.
4. Drawings must be complete and submitted to the architect within 60 days after award of contract for record only.
   a. No review or approval will be forthcoming.
   b. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.
B. Store components indoors prior to installation.
C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.6 WARRANTY

A. Provide manufacturer's 10-year warranty against defects in materials.
   1. Warranty shall provide material to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

1.7 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 — PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the requirements, provide the following product:

1. Nero Mist Honed surfaces (basis of design) selected by owner.

2.2 MATERIALS

A. Material:

1. Homogeneous quartz surfaces material.
2. Material shall have minimum physical and performance properties specified.

B. Thickness:
1. 3 cm (1 1/8").

C. Edge treatment:
1. Selected by Owner

D. Seam width:
1. <1/8" unless otherwise specified.

E. Sink mounting:
1. Undermount.
2. Drop in.

F. Backsplash:
1. Applied.

G. Endsplash:
1. Applied.

H. Performance characteristics: Physical properties data sheet:

Property	Typical Result	Test Procedure
Flexural Strength	>5,300 psi	ASTM D 790
Flexural Modulus	5.3–5.7E^{6} psi	ASTM D 790
Flexural Elongation	>0.1%	ASTM D 790
Compression Strength (Dry)	~27,000 psi	ASTM C 170
Compression Strength (Wet)	~24,000 psi	ASTM C 170
Hardness	7	Mohs' Hardness Scale
Thermal Expansion	1.45 x 10^{-5} in./in./°C	ASTM D 696
Gloss (60° Gardner)	45–50	ANSI Z 124
Colorfastness	Passes	ANSI Z 124.6.5.1
Wear and Cleanability	Passes	ANSI Z 124.6.5.3
Stain Resistance	Passes	ANSI Z 124.6
	(stain 5.2, chemical 5.5, cigarette 5.4 resistances)	
Fungal and Bacterial Resistance	No growth	ASTM G 21 & G
22High Temperature	None to slight effect	NEMA LD 3.3.6* Resistance (356°F)
Boiling Water Resistance	None to slight effect	NEMA LD 3.3.5*

Freeze-Thaw Cycling	Unaffected	ASTM C 1026
Point Impact	Passes	ANSI Z 124.6.4.2
Ball Impact	164 inches	NEMA LD 3.3.8*
Slip Resistance	Above 0.80 for textured models	ASTM C 1028
Static Coefficient of Friction	0.89/0.61 (wet/dry)	ASTM C 1028 (as received)
Static Coefficient of Friction	0.87/0.65 (wet/dry)	ASTM C 1028 (with renovator)
Abrasion Resistance	139	ASTM C 501
Specific Gravity	2.44	ASTM D 792
Density	~2400 kg/m3	
Water Absorption	0.12%	ASTM C 373
Long- and Short-Term	<0.04%	ASTM D 570
Moisture Expansion	<0.01% on average	ASTM C 370
Toxicity	Passes, LC50=68–128	
Pittsburgh Protocol		
Flammability	For all colors tested (Class I and Class A)	ASTM E 84, UL 723 and NFPA 255
Flame Spread Index	FSI <10 for 3 cm and <15 for 2 cm	
Smoke Developed Index	SDI <50 for 3 cm and <100 for 2 cm	
Nominal Thickness	2 cm and 3 cm	
Nominal Weight	10 lb./ft.2 (2 cm) 15 lb./ft.2 (3 cm)	

* NEMA results based on the NEMA LD 3-2000

2.3 ACCESSORY PRODUCTS

A. Joint adhesive:

1. Adhesive to create color-matched seam.

B. Sink/bowl mounting hardware:

1. Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.4 FACTORY FABRICATION

A. Shop assembly

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Form joints between components using manufacturer's standard joint adhesive joints.
    a. Reinforce as required.

3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
    a. Rout cutouts, radii and contours to template.
    b. Smooth edges.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.
    1. Color:
        a. Nero Mist Honed

PART 3 — EXECUTION

3.1 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
    1. Tops:
        a. Flat and true to within 1/8" (3 mm) of a flat surface over a 10' length.
        b. Allow a minimum of 1/16" to a maximum of 1/8" (3 mm) clearance between surface and each wall.
B. Form field joints using manufacturer's recommended adhesive, with joint widths no greater than 1/8" (3 mm) in finished work.
    1. Keep components and hands clean when making joints.
C. Sinks:
    1. Adhere undermount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
    2. Adhere drop-in sinks/bowls to countertops using manufacturer-recommended adhesives and color-matched silicone sealant.
D. Provide backsplashes and endsplashes as indicated on the drawings.
    1. Adhere to countertops using manufacturer's standard color-matched silicone sealant.
E. Keep components and hands clean during installation.
    1. Remove adhesives, sealants and other stains.
    2. Components shall be clean on date of substantial completion.
F. Connections:
    1. Make plumbing connections in accordance with Division 15.
    2. Make electrical connections in accordance with Division 16.

3.2 CLEANING AND PROTECTION

A. Keep components clean during installation.
    1. Remove adhesives, sealants and other stains.
B. Protect surfaces from damage until date of substantial completion.
    1. Replace damaged work.

3.3 SCHEDULE

A. As shown on architectural drawings

END OF SECTION 06652

SECTION 07110 – WATERPROOFING & DAMPPROOFING

PART ONE - GENERAL

DESCRIPTION

Provide and install all water proofing, damp proofing, vapor barriers, and thru-wall flashings where indicated on drawings and specified herein.

Provide and install spray-on waterproofing on exterior brick veneer and exposed grade beams.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements
Grading: Section 02200
Cast-in-Place Concrete: Section 03300
Masonry: Division 4
Painting: Section 09900

PRODUCT DELIVERY, STORAGE, AND HANDLING

Store materials above ground on level platforms in unopened containers. Cover and store in approved manner, which will protect them from weather exposure.

PART TWO - PRODUCTS

VAPOR BARRIER: Densely structured, heavy duty single ply 11 mil thick (0.011) vinyl plastic sheet. Tape all joints & penetrations for a positive seal.

THRU WALL PLASTIC WALL FLASHING: 30 mil polyvinyl chloride sheet with plasticizers and other modifiers. Formed into uniform flexible sheets. Black in color.

ADHESIVES: Type recommended by flashing manufacturer for weather resistant seaming and adhesive application of wall flashing sheet.

SPRAY WRAP MVT BY PROSOCO – R-GUARD: Installed per the details. Air & Water Barrier fluid applied water-resistant barrier.

INSPECTION

Inspect surfaces to verify suitability.

Verify proper fill and compaction for vapor barriers under slabs on grade. Report unsatisfactory conditions.

PREPARATION

Clean surfaces to be treated of oil, grease, dirt, laitance and loose material. Point and fill holes, joints, and cracks flush, grind down high spots and rough surfaces and leave smooth. Moisture content of surface shall be as recommended by material manufacturer.

INSTALLATION

Install all products in accordance with manufacturer's instructions and recommendations.

VAPOR BARRIERS: Over leveled fill material under floor slabs on grade, place one layer of membrane material, lapping edges at least 6". Lap and seal joints; seal edges to wall, column bases, etc. fold and cement corners, or otherwise make vaporproof. Provide sealed contact with piping and penetrating features.

Seal punctures and cuts before placing concrete.

WALL FLASHING: Where shown on drawings and at all exterior walls where masonry or panels rest on concrete grade beams, floors and steel shelf angles place membrane flashing.

Apply where concealed wall flashing is indicated; at head, sills of exterior masonry openings; at exterior wall damp courses; under sheet metal copings; as otherwise indicated.

Start flashing 1/2 inch from exterior face of wall; vertical leg carried up at least 6 inches; top terminated in first course of back-up masonry.

Openings: at heads, sills of masonry openings; carry head flashing 6 inches beyond ends of steel lintels; at heads, sills turn up ends to form pans, with corners folded, not cut.

Flashing for Horizontal Masonry Surfaces: laid in slurry or fresh mortar, topped with fresh full bed of mortar.

Flashing for Vertical Masonry Surfaces: laid on surfaces, sufficiently spotted with

mastic to hold

Joints: lapped at least 4 inches; contact surfaces coated with adhesive.

END OF SECTION 07110

SECTION 07210 – BUILDING INSULATION

PART ONE - GENERAL

DESCRIPTION

Provide thermal and sound control insulation as shown on drawings and specified herein.

Definition: R-value designation is the thermal resistance of insulation only, not including alleged air spaces or other factors assumed to result in higher R-values.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Gypsum Drywall System: Section 09250
Acoustical Treatment: Section 09511
Mechanical Systems insulation: Division 15

SUBMITTALS

Samples: Submit samples of each material or product to be used, clearly identified with manufacturer's name, brand name, R-value, and composition.

Manufacturer's Literature: Manufacturer's recommended installation instructions, including procedures for use of adhesive.

Certificates: Manufacturer's certification that materials meet specification requirements.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver materials to project site in manufacturer's original unopened packaging.

Identify contents, manufacturer, brand name, thermal values, and applicable standards.

Store materials in area protected from weather, moisture and open flame or sparks.

Remove damaged material from site.

ENVIRONMENTAL REQUIREMENTS

Do not install rigid board insulation when temperature is 40 degrees F or below, during rain or wet weather, or when surfaces are wet.

SCHEDULING

Coordinate installation with other trades whose work may be affected.

PART TWO - PRODUCTS

MATERIALS

FIRBROUS (BLANKET) INSULATION: Un-faced mineral fiber or glass fiber, FS HH-I-521 E Type 1, flame spread 25, fuel contribution 0, smoke developed 50. "R" value & thickness as indicated on drawings. If none indicated, minimum "R" value shall be 30, nominal thickness 10". Provide insulation @ all new acoustical ceilings and interior stud walls (faced at interior wall locations).

BIB SYSTEM: Blown In Batt System. This application is applied by a mesh attached to the studs with hoses inserted into the cavity blowing the fiber glass insulation. Provide a fiber glass blown insulation into a cavity wall forming a seamless blanket of insulation. Minimum "R" value shall be R-22 @ all exterior walls, conference, and restrooms.

1/2" GYPSUM SHEATHING INSULATION BOARD (Exterior Sheathing): Shall be DensGlass Gold Exterior Guard: 1/2" (12.7mm) thick by 4' by 8', 9' or 10' (1.9 lb. per square foot) or an approved equal. Tape all joints prior to installation of veneer.

PART THREE - EXECUTION

INSPECTION

FIBROUS (BLANKET) INSULATION:

Examine areas scheduled to receive insulation to insure protection against inclement weather and other hazards and work of preceding trades is completed.

Examine space allocated for insulation for proper depth to receive material.

Proceed with installation only when conditions are satisfactory.

INSTALLATION

FIBROUS (BLANKET) INSULATION:

Install unfaced 6" batt insulation in all stud partitions and above all acoustical ceiling panels unless indicated on drawing otherwise. (Insulation shall terminate at ceiling height at interior partitions/insulation shall enclose total exterior envelope at exterior stud framing.

Fit insulation snugly between framing.

Maintain integrity of insulation over entire area to be insulated.

Carefully cut and fit insulation around pipes, conduits, and other obstructions. Where pipes or conduit are located in stud places, place insulation between exterior wall and pipe, compressing insulation where necessary.

Do not install insulation requiring compression in excess of 10%.

CLEAN UP

Remove adhesive splatters and smears.

Remove debris from project site.

Leave work areas in clean condition.

END OF SECTION 07210

SECTION 07219 - OPEN-CELL SPRAY FOAM INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Open-cell spray polyurethane foam insulation.

1.2 RELATED WORK

A. The following items are not included in this Section and are specified under the designated Sections:

1. Section 06100 - ROUGH CARPENTRY: Wood framing.
2. Section 07210 - BUILDING INSULATION: Supplemental blanket, batt and roll insulation.
3. Section 07900 - JOINT SEALANTS: Rod and sealant at control and expansion joints.

1.3 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for flame and smoke, concealment, and over coat requirements.

B. JM ocSPF Spray Applied Polyurethane Insulation is approved for use as a nonstructural thermal insulating material in Type I and V construction under IBC and dwellings under IRC when installed in accordance with ICC ES Report ESR-1655. Insulation is for use in wall cavities, floor assemblies, ceiling assemblies or attics and crawl spaces when installed in accordance with Section 4. Insulation may be used in wall assemblies in fire-resistive rated-construction as described in Sections 3.6 and 4.4.

1.4 SUBMITTALS

A. Product Data: Submit 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.

B. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing urethane foam products and systems of this section with minimum ten years documented experience.

B. Installer Qualifications: A current Johns Manville Qualified Applicator specializing in performing Work of this section with minimum three years documented experience.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging, clearly marked with the manufacturer's name, brand name, product identification, type of material, safety information, manufacture date, and lot numbers until ready for installation.

B. Store spray foam materials between 65 degrees F (18 degrees C) and 85 degrees F (29 degrees C) with careful handling to prevent damage to products.

C. Protect all materials from freezing and other damage during transit, handling, storage, and installation.

1.7 PRE-INSTALLATION MEETINGS

A. Convene pre-installation meeting prior to commencing work of this section.

1. Attendance: Architect, Contractor, manufacturer’s representative and spray insulation applicator.
2. Agenda: Review installation sequence and scheduling.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not apply the polyurethane foam when substrate or ambient air temperatures are below 40 degrees F (4.4 degrees C) or above 120 degrees F (49 degrees C) and relative humidity is greater than 85 percent unless advance means and methods are recommended by the manufacturer.

C. Do not apply polyurethane foam when wind velocity exceeds 15 miles per hour unless advance means and methods are recommended by the manufacturer. Use precautions to prevent damage to adjacent areas from fugitive overspray.

PART 2 - PRODUCTS

2.1 OPEN-CELL SPRAY FOAM INSULATION

A. Basis-of-Design: Johns Manville

B. Approved equals is Certainteed, Arnthane, SkyInsualtion or an approved manufacturer that meets this performance specification.

C. Open Cell Spray Foam Insulation: Two-component, polyurethane cellular foam with a nominal density of 0.5 pcf, as manufactured by Johns Manville. JM ocSPF foam shall have the following minimum physical properties when cured:

1. Apparent Density: 0.5 pcf when tested in accordance with ASTM D 1622.
2. R-Value (aged) when tested in accordance with ASTM C 518: 3.9 at 1 inch, 13 at 3.5 inches, 19 at 5.5 inches.
3. Oxygen Index: 25 when tested in accordance with ASTM D 2863.
4. Compressive Strength: 0.5 psi when tested in accordance with ASTM D 1621.
5. Fungi Resistance: Zero Rating when tested in accordance with ASTM G 21.
6. Air Leakage: Less than 0.02 (L/s)/m2 when tested in accordance with ASTM E 283.
7. Sound Transmission Coefficient: 51 (STC) when tested in accordance with ASTM E 90.
8. Noise Reduction Coefficient: 0.7 (NRC) when tested in accordance with ASTM C 423.
9. Open Cell Content: Greater than 90 percent when tested in accordance with ASTM D 2846.
10. Tensile Strength: Less than 5 psi when tested in accordance with ASTM D 1623.
11. Shear Strength: 1.4 psi when tested in accordance with ASTM C 273.
12. Permeability: 21 perm-inch when tested in accordance with ASTM E 96.
13. Dimensional Stability: Less than 15 percent change in volume when tested in accordance with ASTM D 2126.
14. Surface Burning Characteristics:

a. Flame Spread/Smoke Developed: At maximum 4 inch (102 mm) thickness, flame spread index of less than 25 and a smoke developed index of less than 450 when tested in accordance with ASTM E 84.
b. Corner Test: Thickness up to 12 inches (305 mm) for wall cavities and 16 inches for ceiling cavities meets NFPA 286 when covered with 1/2 inch (13 mm) gypsum board or equivalent thermal barrier.

D. Primer as Applicable to Substrate: A water based epoxy primer to achieve superior adhesion and penetration on concrete, masonry, metal, wood, etc. as supplied by Johns Manville or approved equal.

2.2 ACCESSORIES

A. Intumescent coating for spray foam insulation in attic and crawlspace applications, as manufactured by Johns Manville. Provide per code.

B. Gypsum board assemblies providing a 15 minute fire separation thermal barrier rating are specified in Section 09200.

C. Gypsum board assemblies providing a 1 hour fire resistant rating are specified in Section 09200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all surfaces to receive polyurethane foam insulation are clean, dry and free of dust, dirt, debris, oil, solvents and all materials that may adversely affect the adhesion of the polyurethane foam.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Mask and protect adjacent surfaces from over spray.

C. Prepare surfaces using the methods recommended by the spray foam manufacturer for achieving the best result for the substrate under the project conditions.

D. Wood:

1. Plywood shall contain no more than 18 percent water, as measured in accordance with ASTM D 4449 and ASTM D 4444.
2. Most untreated and unpainted wood surfaces need not be primed. The spray polyurethane foam can be applied directly to the dry wood. Priming may be required under certain conditions as recommended by the manufacturer.

E. Steel:

1. Primed: Clean primed metal surfaces free of loose scale, rust, weathered or chalking paint. Remove grease, oil, or other contaminants with proper cleaning solutions.
2. Previously Painted: Clean painted metal surface using hand or power tools to remove loose scale and dirt. Remove grease, oil, and other surface contaminants using a power wash technique or proper cleaning solutions.
3. Galvanized: Clean galvanized steel as recommended by manufacturer. Steel should be primed with primer at the rate of 1 gallon per 300 square feet.
4. Unpainted Steel: Clean as recommended by manufacturer to prepare the steel surface for the primer. Prime with primer at the rate of 1 gallon per 300 square feet.

F. Concrete and Masonry: Must be cured and loose dirt and any other contaminants, including asphaltic materials removed. If primer is required, prime at the rate of one gallon per 300 square feet.

G. Sheathing Board: Most sheathing boards need not be primed prior to the application of sprayed-in-place polyurethane foam.

3.3 PRIMER APPLICATION

A. Prepare surfaces and apply primer in accordance with manufacturer's instructions.

B. Apply primer to the properly prepared substrates in accordance with the manufacturer’s instructions to achieve a minimum thickness of dry film thickness. Allow primer to cure 24 hours prior to application of spray polyurethane foam or other products.

3.4 INSTALLATION

A. Install in spray foam in accordance with manufacturer's instructions.

B. Spray polyurethane foam components (A) and (B) shall be processed in accordance with instructions found on the manufacturers product datasheet.

C. Schedule application to anticipate climatic conditions prior to application to ensure highest quality foam and to maximize yield. All substrates to be sprayed must be dry at the time of application. Moisture in the form of rain, fog, frost, dew, or high humidity greater than 85 percent R.H is not permitted unless Contractor reviews means and methods of spraying with manufacturer's representative prior to installation. Use screens, masking and other precautions to prevent damage to adjacent areas from fugitive overspray.

D. Where spray foam system is installed within attics or crawl spaces where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC Section 2603.4.1.6 and IRC Section R314.5.4, as applicable. The ignition barrier must be installed in a manner so that the foam plastic insulation is not exposed. JM ocSPF, as described in these sections, may be installed in unvented attics in accordance with IRC Section R806.4.

E. Application in attics and crawlspaces with Intumescent Coating:

1. JM ocSPF insulation may be installed in unvented conditioned attics in accordance with IRC Section R806.4.
2. In attics, spray foam insulation may be spray-applied to the underside of roof sheathing and roof rafters.
3. In crawlspaces, spray foam insulation may be spray-applied to the underside of floors as described in this section.
4. Thickness of JM ocSPF open-cell foam applied to the underside of the top space must not exceed 10 inches (254 mm).
5. Thickness of JM ocSPF open-cell foam applied to vertical surfaces must not exceed 12 inches (300 mm).
6. JM ocSPF must be coated uniformly coated with JM intumescent coating at a coverage rate of 0.6 gallons per 100 square feet in accordance with manufacturer's instructions.
7. Surfaces to be coated must be dry, clean, and free of dirt, loose debris, and any other substances that could interfere with the adhesion of the coating.
8. Coating must be applied when ambient and substrate temperatures are above 50 degrees F (10 degrees C) and requires a 24-hour curing time after application.

F. Application in attics and crawlspaces with Minimum 1⁄2 inch (12.7 mm) Gypsum Board.

1. In attics, spray foam insulation may be spray-applied to the underside of roof sheathing and roof rafters.

2. In crawlspaces, spray foam insulation may be spray-applied to the underside of floors as described in this section.
3. Thickness of JM ocSPF open-cell foam applied to horizontal surfaces must not exceed 16 inches (406 mm).
4. When applied to vertical surfaces, the thickness of JM ocSPF open-cell foam must not exceed 12 inches (305 mm).

G. Application on Attic Floors:

1. JM ocSPF must be separated from the area beneath the attic by an approved 15 minute rated coating.
2. JM ocSPF maximum height is 12 (305 mm) inches.
3. JM ocSPF must be coated with 0.6 gallons per square foot of JM intumescent coating.
4. JM ocSPF insulation may be installed to a maximum thickness of 12 inches (254 mm) between joists in attic floors. JM ocSPF insulation must be separated from the area beneath the attic by an approved thermal barrier. The ignition barrier in accordance with IBC Section 2603.4.1.6 and IRC Section R314.5.3 may be omitted when installed in accordance with this Section.

H. One-hour Fire-Resistance Rated Wall Assemblies (Limited Load Bearing):

1. Interior Face: One layer of 5/8-inch-thick (15.9 mm) Type X gypsum wallboard must be applied parallel to the interior face of 2-by-6 wood studs space a maximum of 16 inches (406 mm) on center and fastened with Type S, 1-5/8 inch (41 mm) long screws spaced 8 inches (203 mm) on center. The interior cavity is filled with 3 inches of JM ocSPF spray- applied foam insulation.
2. Exterior or Opposite Face: Another layer of 5/8 inch (15.9 mm) thick Type X gypsum wallboard must be applied in the same manner as the interior face.
3. Axial Load Design: Axial loads applied to the wall assembly must be limited to the least of the following:

    a. 2,756 pounds (122 642 N) per stud.
    b. A maximum of 51 percent of the load calculated in accordance with Sections 3.6 and 3.7 of the ANSI/AF&PA NDS.

I. Exothermic Caution:

1. Polyurethane foam shall be sprayed in minimum 1/2 inch (12.7 mm) thick passes or lifts. Overall thickness applied in one pass shall be limited to a maximum of 6 inches for JM ocSPF open cell foam to avoid fire hazards resulting from excessive heat generation. When applying SPF on chlorinated

polyvinyl chloride the pass thickness for JM ocSPF must be limited to 6 inches. If additional thickness is required it must applied within 15 minutes.

2. If a second pass is needed, wait 10 to 15 minutes between passes to allow reaction heat to dissipate. If more passes are needed, wait 30 minutes between passes to allow reaction heat to dissipate.
3. The exothermic reaction can cause temporary substrate thermal rises in excess of 150 degrees F, which may result in substrate thermal expansion. If the substrate then contracts when the reaction heat dissipates, substrate deformation can occur.
4. The full thickness of spray polyurethane foam to be applied within any given area should be completed in one day.

J. Vapor Retarder Application:

1. When required, a vapor retarder shall be applied to the substrate to be insulated or to the finished spray polyurethane foam insulation. The predominant direction of the vapor drive determines the location of the vapor retarder relative to the spray polyurethane foam.
2. Apply thermal barriers and vapor retarder (if required) according to ICC recommendations.

3.5 ACCESSORY APPLICATION

A. Joint Filler Foam and Caulk: Use joint filler foam and/or caulk to seal around windows, doors, chimneys, electrical raceways, sill plates, multiple studs, etc. Expansion of joint filler foam in a confined space can tighten window frames and door jambs. Use care in these areas to avoid distortion of these members.

3.6 FIELD QUALITY CONTROL

A. Protect installed products until completion of project.

B. Field inspection and testing will be performed under provisions of Section 01 40 00. Inspection will include verification of insulation and overcoat thickness and density.

3.7 PROTECTION

A. Protect installed products until completion of project.

B. After completing work, clean glass and spattered surfaces.

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07219

SECTION 07240 EXTERIOR INSULATION & FINISH SYSTEM

PART ONE - GENERAL

DESCRIPTION

Furnish and install all finish, channels, mesh, expansion joints, sheathing, framing and related accessories as shown on drawings and specified herein including anchors and suspension wire.

Also included are control joints, expansion joints, metal molding sections, drip screeds.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Rough Carpentry: Section 06100
Membrane Waterproofing: Section 07150
Gypsum Drywall Systems: Section 09260
Painting: Section 09900

OUALITY ASSURANCE

Obtain products from a single manufacturer or from manufacturers recommended by the prime manufacturer of the system.

The manufacturer of the system shall be a member of the exterior insulation Manufacturer's Association (EIMA).

Application shall be approved by the manufacturer. Follow Manufacturer's latest printed instructions.

System shall be approved for use by BOCA, ICBO, SBCCI or regulating agency having jurisdiction on the project.

After processing of the initial submittals and before delivery of final material, prepare a sample installation of exterior wall insulation and finish system approximately 64 sq. ft. in area applied on each different substrate. When cured, view mock-up with Architect and make adjustments in materials and installation procedures to comply with requirements and provide new mock-up if required. Acceptable mock-up shall remain in place until final work is completed and approved.

Submit manufacturer's product data and installation instructions for review.

Submit manufacturer's acceptance of substrate including verification of system compatibility with mastic vapor barrier where indicated.

Submit laboratory test reports on surface burning characteristics, strength and weatherization including date of test and laboratory's interpretations of test data.

Submit current approved application certification.

WARRANTY

Special Project Warranty: Submit 5 year warranty, executed by Contractor, and cosigned by installer and Manufacturer, agreeing to repair/replace work of this section, which has cracked, flaked, discolored, or otherwise deteriorated to a improper condition where it is not performing as intended due substantially to defective materials or workmanship.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver to Project in original unopened packaging and legible manufacturer's identification.

Store products in a cool dry place out of direct sunlight, protected from the elements and from damage. Protect products from freezing.

JOB CONDITIONS

ENVIRONMENTAL REQUIREMENTS

Application of the system shall be in ambient temperatures above 40 degrees F and rising, and on unfrozen surfaces. For installation in temperatures less than 40 degrees F supplementary heat shall be provided.

A minimum ambient temperature of 40 degrees shall be maintained for at least 24 hours after the system installation.

PROTECTION

Protect surrounding areas and surfaces to preclude damage during application of the system.

Protect finished work when stopping for the day or when completing an area in order that water will not penetrate behind the system.

COORDINATION

The Work of this section requires close coordination between related sections.

The cap flashing shall be installed as soon as possible after the installation of the system.

All joints to be caulked shall be done immediately after the installation of the system.

PART TWO - PRODUCTS

ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products of the following:

1. Dryvit Systems, Inc., West Warwick, R.L
2. Sto Corporation Finish System Products Division
3. Tiefs Wall Systems, San Antonio, Texas
4. Pyrex

MATERIALS

Mastic adhesive for adhering insulation to substrate.

Insulation Board: Polystyrene board of 1 1/2" thickness foam over ½" Dens Glas or as indicated on plans. V grooves shall be as indicated on elevations.

Mechanical Fasteners: Non-rusting, self-tapping screws with washer attachments, as recommended by manufacturer.

Reinforcing Mesh: Fiberglass open-weave fabric conforming to ASTM D-1682. Heavy Duty Reinforcing mesh, as recommended by manufacturer.

Mix Coating: A factory pre-mixed base coat and finish coat consisting of ASTM C-150 type 1 portland cement, ASTM C206 class "S" hydrated lime, silicas, binders, glass fibers and additions as recommended by the manufacturer.

Metal Trim: Accessories and related items shall be of aluminum.

Sealer and Admixture: As recommended by manufacturers.

Provide expansion joints, as recommended by manufacturer.

PART THREE - EXECUTION

INSPECTION

Verify that surfaces are sound, dry, free of dirt, grease, curing compound, coatings, indentations, pits, voids, or planar irregularities exceeding.

Verify that abutting surfaces, openings and, penetrations are in proper condition to receive installation.

Beginning of installations means acceptance of substrates.

PREPARATION

Mask off and protect adjacent surfaces from damage by installation.

INSTALLATION ON INSULATION BOARD, FABRIC

Field cut board accurately to fit openings and projections.

Use temporary fastening method to secure board to wall surfaces following manufacturer's instructions.

If necessary, rasp butt joints to smooth, even joints, insuring no planar irregularities, greater than
1/16".

Install starter channels and casing beads at perimeters of finish areas in accordance with manufacturer's instructions.

Install reinforcing glass fabric over entire area, except expansion areas, overlap vertical edges 3 inch and corners 4 inch. Install heavy duty mesh for surfaces between finish grade and window sill (2'-6" above finish floor).

Permanently anchor mesh and insulation board as specified.

INSTALLATION OF BASE COATS AND FINISH COATS

Apply bonding solution to surface areas in accordance with manufacturer's instructions, allow to tack before coating application.

Mix and apply base coat in accordance with manufacturer's instructions to install wall surfaces. Trowel base coat into mesh in a tight coat and doubled to 1/8 to 1/16 inch thickness to level out surface area. Insure there is no shadowing of board joints, or telegraphing of mechanical fasteners.

Mix and apply texture coat in accordance with manufacturer's instructions, finish to even and consistent texture to match approved sample. Allow to dry thoroughly before applying sealer.

Mix and apply cement glaze sealer in accordance with manufacturer's instructions, insuring color consistency and evenness.

CLEANING

Remove masking materials, clean coating materials from adjacent surfaces.

END OF SECTION 07240

SECTION 07400 - METAL ROOF & WALL SYSTEM

PART ONE - GENERAL

DESCRIPTION

Provide and install standing seam roof / wall panels and trim as shown on Drawings and specified herein. **Metal roof / wall system and accessories shall achieve an undivided and single source responsibility.**

Also included is the installation of closures, roof edge, clip fasteners, ridge cap, rubber vent flashing, curbs and all accessories for a complete watertight system.

Install all required curbs of flashing systems compatible with profile of roof system.

RELATED WORK SPECIFIED ELSEWHERE

1. General & supplementary Conditions, Special Requirements
2. Flashing and Sheetmetal: Section 07600
4. Pre-engineered Metal Building Components 13000

QUALITY ASSURANCE

GENERAL: It is the intent of this specification to describe a 24 ga. standing seam metal roof system with factory finish. Including details, materials and methods of application for a complete system.

Manufacturer is to be in business a minimum of (5) five years.

Applicator shall be certified by manufacturer.

Qualifications: Furnish written proof upon submitting bid to Owner, stating that the Roofing Contractor is a manufacturers approved applicator of the roofing system to be installed and that the Roofer can secure the Twenty Year Manufacturers Warranty for the specified system.

Certification: Installation of insulation and roofing shall meet requirements of Factory Mutual regarding fire and uplift due to wind. Factory Mutual Class 1-60.

Contractor shall be required to attend a review of the roofing system with Designer and Owner to make inspections of the roofing system toward the end of the one (1) year warranty period and toward the end of the roofing guarantee period.

Contractor shall make approved repairs and/or replacements as covered by the guarantee.

Owner may at his option select and employ at the Owner's Expense:

> A Roofing Systems Consultant to review the Construction Documents and/or perform surveillance during any installation of substrate, roofing, flashing and any other part of the total roofing system.

The roofing /wall system product supplier shall furnish the Roofing Contractor with Material Safety Data Sheet/Sheets (MSDS), incorporating OHSA approved form, current edition. Said sheets shall be available at the site at all time until project completion.

PRE-ROOFING CONFERENCES

The Owner, Architect, Contractor and Roofing Contractor shall attend a pre-roofing conference conducted by the Architect at the site prior to the beginning of any phase of the roof work.

SUBMITTALS

Submit shop drawings and manufacturer's literature in triplicate. Shop drawings are required for final inspection of the warranted roof. Shop drawings shall be made by manufacturer.

Shop drawing shall include outline of roof/wall, roof size, location of penetrations, perimeter details, anchoring device locations and special details.

At completion of Project, Roofing Contractor shall submit to Owner, in a ring binder, two copies of all roofing data, including manufacturers catalogs/manuals of materials and accessories used in the project.

Roofing Contractor shall submit at completion of job as-built specifications, including all change orders and shop drawings and details utilized on project in 3-ring binder.

GUARANTEES

The roof and associated work shall be guaranteed against leaks from faulty or defective materials and workmanship for a 20 Year Guarantee.

Representative of the Designer, Owner, the General Contractor, the Roofing contractor and Roofing Manufacturer's representative shall make inspections of the roofing system toward the end of the one (1) year warranty period and toward the end of the Roofing Contractor's guarantee period. Further, the Roofing System Manufacturer's authorized technical representative shall inspect the roofing system at the conclusion of the Manufacturer's Guarantee and report same to the User with copy to Owner. The Roofing Contractor or Roofing Systems Manufacturer, as applicable, shall make approved repairs and/or replacements covered by the Guarantee. Project will not be accepted until the Roofing Contractor's Guarantee, executed in strict accordance with the Roofing Guarantee included herein and made a part of Contract Documents as been submitted and accepted by the Owner.

The roof system and associated work shall be guaranteed against leaks from faulty or defective materials and workmanship for an applicable period shown on guarantee, starting on the date of the Owner's acceptance of the project.

The Roofing Guarantee shall be executed in duplicate, signed by the appropriate parties and submitted to the Owner through the Architect.

A separate Ten (10) Year Guarantee shall be furnished by the manufacturer of the materials of the roofing system. The sample form of the guarantee shall be delivered to the Architect from the manufacturer through the Contractor. The manufacturer is to include a list of all component parts of the roofing system that shall be guaranteed. The manufacturer's letter shall also state acceptance of the installer of the roofing system. This form, list and letter shall be received and reviewed by the Architect for compliance as a shop drawing and specification prior to conducting the Preliminary Roofing Conference.

The Roofing Manufacturer's Guarantee shall guarantee at the manufacturer's own cost and expense, to make or cause to be made such repairs to or replacement of, to correct any and all faulty installations or materials of the roofing system, to keep the roofing system in a watertight condition throughout the 10 Year Guarantee period. The guarantee shall not be prorated. The executed guarantee shall be delivered to the Architect in three original counterparts prior to acceptance of the Work.

The definition of the roofing system includes the materials and methods used from the deck up. Included are the metal counter flashing, edging, caps and copings, vent covers (pre-manufactured) and gutters and downspouts.

PRODUCT DELIVERY, STORAGE, AD HANDLING

Do not deliver materials until roofing operation is ready to begin.

Deliver materials in manufacturer's original, unopened containers with labels intact and legible, and in sufficient quantity to allow continuity of work.

Store all roofing materials on clean, raised platforms with weather protective covering.

Protect materials against damage by construction traffic.

Provide continuous protection of materials.

Remove wet and/or damaged materials from jobsite.

Comply with fire and safety regulations.

JOB CONDITIONS

Apply roofing in dry weather.

Install only as much roofing system as can be completed each day. Once started, continue roofing without interruption until completed.

Do not store or allow access on any adjacent completed built-up roof surfaces.

PART TWO - PRODUCTS

METAL ROOFING SYSTEM

ROOF PANELS: Furnish and install 24 gauge x 18" wide standing seam colorklad standing snap lok roof with *Kynar 500 finish*. Seam height shall be 1/ 3/4" (min). Approved Manufacture: PAC Clad or MBCI 18". Color shall be selected from standard colors.

The metal roof panels shall be installed over wood decking. Metal roof panel shall be a 24 gauge standard panel with pencil ribs. Color shall be selected from their standard colors. No lap joints. The panel shall extend from ridge to eave.
All exposed metal flashing at parapet walls, eave trim, downspouts, and fascias shall be colorklad to match roof panels. There will be no exposed screws @ fascias, roof/wall panels, eaves, gutters, downspouts, and ridge vents. Thermal

spacers shall be used to separate metal roof & walls panels from insulation and purlins.

RIDGE CAP: At the roof ridge furnish and install a low profile continuous ridge cap, with roof panel color on the exposed metal cap sheet. All roof penetrations at standing seam roof areas to have Neoprene roof jacks for pipes or conduits going through roof, provided by mechanical or electrical contractors. All exposed metal flashing same color as roof panel.

WALL PANELS: Furnish and install 24 gauge x 16" wide concealed fastener colorklad wall panel with *Kynar 500 finish*. Seam height shall be 3/4" (min). Approved Manufacture: MBCI Masterline 16 or PAC Clad,

SOFFIT: At the soffit furnish and install a QwiLok,12", smooth, colors are standard by MBCI or PAC Clad. Colorklad soffit shall be white and may be supplied by roof manufacturer panel if it meets the performance specification.

Perforated panels shall be located @ all overhangs except rakes. (fi applicable)

PART THREE - EXECUTION

General: System shall be installed in strict accordance with manufacturer's specifications for Warranty on complete roofing system.

INSPECTION

Metal panels shall be installed only when the subframe is installed and aligned to acceptable tolerances.

STORAGE

Material protection shall be provided during fabrication, shipment, storage and erection.

During shipment, finished surfaces may be protected from abrasion by a removable plastic film between areas of contact.

Jobsite storage shall be in a clean, dry area out of direct contact with the ground, under cover or sloped for drainage, protected from abuse by traffic and from contamination by corrosive or staining materials.

Stored materials and unfinished work shall be secured against wind damage. Installed panels shall be protected from abuse by other trades.

It shall be the responsibility of the Contractor to provide walk boards in areas of heavy traffic and any other measures required to prevent damage by his own crews and notify the General Contractor of any necessity for protection from other trades.

INSTALLATION

Install panels as per manufacturer's written specifications.

Install vinyl faced batt insulation at required locations.

All work shall be installed in accord with approved shop details under direct supervision of an experienced sheet metal craftsman.

Attachments and joints shall allow for expansion and contraction from temperature changes without distortion or elongation of fastener holes.

Flashings shall be installed in strict accord with the recommended practice in SMACNA Architectural Sheet Metal Manual, latest edition.

Remove any strippable protective coating on flashings prior to installation and in any case do not allow the strippable coating to remain on the panels in extreme heat, cold, or in direct sunlight or other UV source.

Caulk, seal and fasten so as to provide a complete weathertight installation.

Discrepancies between job site conditions and drawings as approved shall be brought to the attention of the Architect or his representative for resolution, prior to installation.

Install all required roof accessories specified under Section 07800 or required by Drawings. Flashing shall be furnished and installed to satisfy conditions of use.

CLEAN-UP

As work progresses, remove excess scrap and keep working surface free from debris on a daily basis.

Touch-up areas as required or directed with manufacturer's standard touch-up paint. Follow instruction for application carefully.

Leave project at completion free from stains and scrap. Wash panel surface with water if necessary.

Final inspection will be at the discretion of the Architect or his representative.

END OF SECTION 07400

SECTION 07600 - FLASHING & SHEETMETAL

PART ONE - GENERAL

DESCRIPTION

Provide flashing and sheet metal as shown on Drawings and specified herein, including reglets, counter flashing, expansion joints and all miscellaneous clips.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:

OUALITY ASSURANCE

Sheet Metal and Flashing Details: Shall be as recommended by manufacturer of Roofing System. The Sheet Metal and Air Conditioning Contractors National Association, Inc., publication ARCHITECTURAL SHEET METAL MANUAL, (SMACNA), latest edition, shall be followed where not in conflict with manufacturer's recommendations.

Responsibility: The Contractor shall subcontract the sheet metal and related items specified in this Section, and in the Single Ply Roofing Section of this specification to a single subcontractor specializing in this type of work so there will be undivided responsibility for the specific performance of all component parts.

SUBMITTALS

Shop Drawings: Furnish shop drawings for all manufactured items. Drawings to show metal thicknesses, finishes, installation details and fastening methods. Furnish standard color charts in duplicate for Architect's selection.

Samples: Furnish full size samples of shop-made metal items if required by Architect.

Manufacturer's Literature: Furnish duplicate copies of manufacturer's literature covering all manufactured items.

Warranty: Roof sheet metal flashing installation except at metal roofing, is subject to warranty as specified to maintain existing warranty.

MATERIALS

Metals: Metal flashing, wall flashing, and expansion joints as indicated on Drawings. Provide all exposed joint covers, end laps, drive pine, sealants and related items as required for a complete system.

Provide @ junctions - 6" cover plates and gravel guards, 90 degree corner covers, and shape ridge covers on fascia.

Sealant shall be type as recommended by manufacturer of reglet and complete assembly shall be installed in accordance with manufacturer's recommendations

Nails & Screws: Fasteners as shown on the drawings, as specified herein, but in no case less than size and type as recommended by manufacturer.

Flashing at Roof Penetrations: Flashings at all roof penetrations, including those required for mechanical and electrical work, shall be provided under this Section. This does not include penetrations at those roof-mounted items which contain integral, pre-fabricated curbs with integral counter-flashing. Provide lead flashing at all roof drains.

Single pipe and conduit roof penetrations up to six (6) inch o.d. shall be flashed and sealed using a Pate Pipe Seal of required size and installed in accordance with manufacturer's recommendations and the included detail.

At multiple pipe and conduit roof penetrations, where the single seal cannot be used, install the Pate Pipe Curb Assembly, size and type as required including all components for a complete installation.

Membrane Flashing: Provide membrane flashing where shown on drawings and at all exterior walls where masonry rests on concrete grade beams, floors and steel shelf angles; and at steel spandrel beams.

Membrane flashing shall be composed of 3 oz. copper sheet bonded between two sheets of textured, woven, high tensile strength glass fabric with a specially blended asphalt compound.

PART THREE - EXECUTION

INSPECTION

Carefully examine all surfaces and substrates prepared for sheet metal by other trades. Notify the Contractor of any defects such as surfaces that are not true,

square, level or plumb, or dry as the case may be, or surfaces not having correct pitch or that are otherwise unsuitable to receive this work. Do not perform this work until the faulty conditions have been corrected.

INSTALLATION

Provide all necessary metal flashing and counter flashing for a complete watertight job. All metal counter flashings shall be set prior to laying wall and shall be placed when walls are laid.

Proper allowance shall be made for expansion and contraction in all metal work.

The exposed edges of all breakmetal work shall be turned under 1/2" (hemmed) in such a manner as to conceal them from view and to permit interlocking or separate continuous angle or channel at bottom for aligning. Welding, brazing, or soldering of joints will not be permitted without approval of Architect.

All breakmetal type fascias and copings shall have a separate continuous angle to channel which shall interlock with bottom edge of fascia or coping at bottom for alignment purposes.

Exposed nailing will not be permitted. Ends of all flashing in block & brick walls shall be turned up and sealed to form a dam. Factory fabricated fascias and reglets shall have manufacturer's standard joint covers, spacing as shown or called for on drawings.

Install all items in accordance with manufacturer's recommendations and approved shop drawings.

All flashing shall be installed straight, level, true to line. No dents, crimps or unlevel conditions shall be acceptable. All unsatisfactory installation shall be removed and re-installed at Contractor's expense. All expansion caps shall be installed symmetrical with span. No exception acceptable.

CLEANUP

All sheet metal surfaces shall be cleaned of all resin, dirt, grease and other foreign substances immediately after this work is finished.

Remove all trash and debris from the site.

END OF SECTION 07600

SECTION 07900 – JOINT SEALERS

PART ONE - GENERAL

DESCRIPTION

Provide and apply calking and sealing as shown on drawings and as specified herein. In general, seal all openings as shown on drawings, and at all other locations which normally require calking to seal against infiltration from air, water and insects, including, but not being limited to, the following:

Construction and expansion joints, joints between dissimilar materials; joints around windows, door frames, louvers, and other penetrations and openings in the exterior wall; paving joints; interior walls as detailed or specified.

Joint sealers @ penetrations through rated construction shall be sealed with a material capable of preventing the passage of flames and hot gases when tested in accordance with ASTM-E814.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Steel Doors & Frames: Section 08110

OUALITY ASSURANCE

All sealing shall be done by qualified applicators.

SUBMITTALS

Furnish manufacturer’s literature for sealants, callings and mastics specified in this Section.

Submit color samples in duplicate of all sealing and calking compounds for approval.

JOB CONDITIONS

Do not proceed with sealant installation during inclement weather unless all requirements and manufacturer’s instructions can be complied with. Do not proceed with installation of elastomeric sealants under extreme temperature conditions which would cause joint openings to be at either maximum or minimum width, or when extreme temperatures or heavy wind loads are forecast during period required for initial or nominal cure of elastomeric sealants.

Contractor shall furnish a 5 year warranty in writing to replace any or all joints failing within warranty period at no cost to Owner, including replacement of other material damaged as result of sealant failure.

PART TWO - PRODUCTS

MATERIALS

Interior Calking (to be painted): One part acrylic latex, ASTM C-834-76.

Exterior Elastomeric Sealant (Building): Polysulfide rubber base, exterior non-acid type, one-part, non-sag, complying with Fed. Spec. TT-S-00230C, Type II, Class A. Acceptable products include “790 Building Sealant” by Dow Coming; “Silpruf’ by General Electric Corp.,”GC-9 Synthacalk” by Pecora Corp. Colors shall be selected by Architect to match adjacent finish.

Exterior Elastomeric Sealant (Paving): Cold applied, two part, job mixed, self leveling urethane compound conforming to Fed Spec. TT-S-00227E Type I, Class A, service temperature range -40 degrees to 180 degrees F. Acceptable products include “Sonolastic Paving Joint Sealer” by Sonnebom Contech; “NR-200” by Pecora Corp; Woodmont
“Chem-Calk 55Øtt

Joint Primer/Sealer: Quick drying type recommended by sealant manufacturer.

Sealant Backer: Open sell, flexible, polyurethane backer rod, of size required for joint and approved for use by the sealant manufacturer.

Preformed Elastic Joint Seals: Acmaseals, open-celled compression type, of vulcanized elastomeric compound, manufactured by Ace Highway Products Corporation. Lubricant/adhesive shall be the appropriate Acma product. Type NN1 by Williams Products, Inc. approved equal.

Fire Caulk: FireTemp Caulk (CI Intumescent) one-component, ready to use sealant manufactured by Johns Manville & USG Fire Stop Systems or and approved equal. Provide manufacturers recommendation for achieving the required rating according to system design listing. Install per manufacturers recommendation. FireTemp Spray (SI Intumescent) modified latex that can be spray, rolled or brushed. Manufactured by Johns Manville & USG Fire Stop Systems or and approved equal. Provide manufacturers recommendation for achieving the required rating according to system design listing. Install per manufacturers recommendation

PART THREE - EXECUTION

INSPECTION

Examine surfaces to receive sealants and calking to insure that conditions will permit satisfactory installation. Do not proceed with installation until unsatisfactory conditions are corrected.

Clean, neutralize and prime all surfaces in accordance with manufacturer's recommendations. Mask edges to protect adjoining surfaces and produce a straight finish line.

INSTALLATION

In general, install all joints with depth equal to one-half joint width. In deeper joints a non-absorbent closed cell expandable polyethylene foam shall be used to bring depth to limit prescribed.

A diameter shall be selected that will cause compression when in place. Joints less than 1/4" will not require foam backing. Use foam or paper tape on working joints as bond breakers for back of joints.

All work shall be done according to manufacturer's printed specifications and instructions. Apply sealants in continuous beads, with open joints, voids or air pockets.

Confine sealants to joint areas with masking tapes or other precautions. Apply compounds in concealed compression joints accurately so that excess compound will not extrude from joint.

Remove excess compound or sealant promptly as work progresses, and clean adjoining surfaces. In rough surfaces or joints of uneven widths, install sealant well back into joint.

Use anti-tack agent where necessary to protect freshly-applied sealant from public traffic and dirt. Joints shall be slightly recessed. All joints throughout construction shall be hand tooled and finished. Set all exterior door thresholds in sealant.

Preformed Elastic Joint Seals: Install in strict accordance with manufacturer's recommendations.

Paving Sealant Application: Expansion and contraction joints and other cracks in concrete paving and walks that develop prior to final acceptance of project shall be sealed with Exterior Paving Sealant. Maximum depth of sealer in joint shall be two inches. Provide backer rods or expansion joint filler material where required. Joint shall be clean of dirt and water. Ambient and sealer temperatures shall be as recommended by manufacturer of sealer. Remove surplus and spilled sealer

material before it becomes solidified.

Protect surfaces from damage. Clean soiled surfaces immediately. Replace with new material and any damaged material which cannot be cleaned.

END OF SECTION 07900

SECTI0N 08110 – STEEL DOORS & FRAMES

PART ONE – GENERAL

DESCRIPTION

Provide hollow metal doors and frames as shown on drawings and specified herein.

Provide accessories as required except those specified under Finish Hardware.

Coordinate with hardware supplier for fitting to template. (Verify continuous hinge)

Doors called for continuous hinges shall have door frame prepped for installation of the continuous hinge.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions
Finish Hardware: Section 08710
Painting: Section 09900

QUALITY ASSURANCE

Comply with applicable requirements of Steel Door Institute S.D.I 100, and Commercial Standard CS242, latest edition, except as revised by specific requirements of the Section.

All labeled fire doors and frames shall be of a type which has been investigated and tested in accordance with UL-10(b), ASTM E-152, NFPA 252, ANSI A2.2 and, when required UL-305.

A physical label shall be affixed to all Underwriters' Laboratories classified fire doors, listed fire door frames or Factory Mutual approved fire doors and frames as evidence of compliance with procedures of the labeling agencies

SUBMITTALS

Submit shop drawings showing thickness of metal, details of construction, profile of molding, connections to other work, fastenings, anchors and reinforcing for hardware. Profiles shall follow architectural drawings.

PACKAGING

Package all doors in full cartons. Bank cartons securely to doors.

DELIVERY, STORAGE & HANDLING

Deliver, receive and handle at the job site in a manner to prevent damage. Store upright in a protected area on runners or skids and cover with vented tarpaulins or vented plastic.

PART TWO – PRODUCTS

MATERIALS

1. Steel-Interior Doors and Frames: Commercial quality cold rolled, ASTM A366.
2. Steel-Exterior Doors and Frames: Electrolytic zinc coated steel, ASTM 591 Class "A".
3. Shop applied paint: Baked-on rust inhibiting paint primer conforming to ASTM B-117.
4. Supports & Anchors: Minimum 16 gauge sheet metal, manufacturer's standard support.
5. UL Rated Frames: As required by code or indicated on Drawings

ACCEPTABLE MANUFACTURES

1. Amweld
2. Steelcraft
3. Mesker
4. Republic
5. Curries
6. Metal Products, Inc.

DOORS

Provide all exterior doors to be Amweld or approved equal (16 gauge galvanized fully welded seamless. Prior approval are acceptable, if they meet the specifications. Must be submitted prior to bidding. Provide steel stiffeners plus polystyrene core.

Provide all interior to be Amweld or approved equal (18 gauge seamless) fully welded seamless. Prior approval are acceptable, if they meet the specifications. Must be submitted prior to bidding. Provide steel stiffeners plus polystyrene core

End Closures: 18 gauge minimum.

Door Faces: 16 gauge exterior; 18 gauge interior.

Labeled doors shall carry Underwriter's Label. UL labels to be applied.

HOLLOW METAL FRAMES

Combination buck, jambs and trim, with miters clean cut, reinforced, fully seal welded and clean off flush. Knockdown types will not be accepted.

Frames: for exterior doors 14 gauge galvanized; interior 16 gauge cold rolled steel.
All UL frames to have applied UL labels on each frame.
Profile per drawings.

Hinge reinforcing plates (14 ga.) shall be factory attached to accommodate specified hinge sizes. Plate adjustable strike plates and door silencers shall be furnished by Manufacturer.

Supply complete components for cased openings, windows and sidelights, stops and other miscellaneous items to provide for a complete installation as sized and scheduled on Drawings.

FABRICATION - GENERAL

Fitting for hardware shall be done at the factory. Mortising, reinforcing drilling and tapping to be done as required by the approved hardware schedule and with templates furnished by Finish Hardware manufacturer. Reinforcement and preparations for hardware shall be done in accordance with ANSI A115 and ANSI 156. Reinforcement to be concealed and minimum 7 gauge.

Reinforce doors and frames which are to receive surface applied hardware. Drilling and tapping to be done in field.

Surfaces shall be smooth, free from warp, wave, buckle and other defects. Corners shall be square.

Welded joints shall be dressed clean and smooth and finished flush with base metal surface. Joints to be imperceptible when finished.

All material shall be shop prime painted.

DOOR & FRAME FABRICATION

Provide cutouts for mortised hardware, accurately located and made to fit hardware. Provide plaster guards in back of hardware cutouts. Offset reinforcement so surface of hardware shall finish flush with surface of door.

Provide glass lite openings. Full glass doors and fixed slat louvers where shown. Under cut doors where indicated on mechanical drawings.

Punch frames for door mutes, 3 on strike side for single doors and 2 at head for pairs.

For all frames, provide one 12 gauge floor slip on bottom of each jamb and angle spreaders at bottom of each frame.

Provide 3 anchors per jamb of type required by wall construction and as indicated on shop drawings. Strikes shall be set out and adjusted to provide clearance for silencers.

SHOP PAINTING

1. Clean metal thoroughly to remove rust, scale, oil, grease or other foreign materials.
2. Fill exposed surfaces with mineral paste filler to eliminate scars and blemishes. Sand to smooth, even surface.
3. Bonderize by chemical treatments to assure maximum paint adherence.
4. Prime paint with dip or spray coat of rust inhibitive paint to all surfaces.

PART THREE - EXECUTION

INSTALLATION

Erect door frames plumb, square, and in proper position to receive partition work. Set frames with heads level.

Rigidly brace frames in place and anchor securely to floor. After building in full height of both jambs, remove bracing and floor spreaders. Use care in anchorages so that jambs will be without twist.

Cope or miter trim and glazing stops with a hairline fit. Avoid tightening screws and fasteners excessively to prevent dimpling of the metal.

Installation of labeled fire doors, including all operating characteristics, labeled frames, and UL listed builders hardware, shall be in accordance with NFPA Publication Nos. 80 and 191 and with the codes of local authorities having jurisdiction.

ADJUST & TOUCH-UP

With Architect's approval, minor damage to metal, incurred during erection, may be repaired by filling with lead or lead alloy, ground smooth and flush, if strength and finish appearance are not impaired.

Remove and replace work showing defects or blemishes without additional expense to Owner.

Touch up places showing abrasion of finish with same paint as applied at factor.

END OF SECTION 08110

SECTION 08200 - WOOD DOORS

PART ONE – GENERAL

RELATED DOCUMENTS

General & Supplementary Conditions
Finish Hardware: Section 08710
Glass & Glazing: Section 08800
Painting: Section 09900

SUMMARY

Extent and location of each type of flush wood door is indicated on drawings and in schedules.

Types of doors required include the following:

Stained Grade divided light and 2 panel flush wood doors is included in this section.

Metal door frames for flush, wood doors are specified in. another Division - 8 section.

SUBMITTALS

Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, and factory-finishing specifications.

Shop Drawings: Submit shop drawings indicating location and size of each. door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and. other pertinent data.

For factory pre-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

Samples: Submit samples, 1'-0" square or as indicated, for the following:

Wood Faced Doors: Each color, finish and pattern required.

Factory Finished Doors: Each type of factory finish required.

QUALITY ASSURANCE

Quality Standards: Comply with the following standards:

NWWDA Quality Standard: I.S.1 “Industry Standard for Wood Flush Doors”, of National Wood Window and. Door Association. (NWWDA).

AWI Quality Standard: “Architectural Woodwork Quality Standards”, including Section 1300 “Architectural Flush Doors”, of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

NWWDA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S.1 Series.

For manufacturers not participating in NWWDA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

Manufacturer: Obtain doors from a single manufacturer.

PRODUCT DELIVERY, STORAGE, AND HANDLING

Protect doors during transit, storage and handling, to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet “How to Store, Handle, Finish, Install, and Maintain Wood Doors”, as well as with manufacturer’s instructions.

Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

PROJECT CONDITIONS

Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project’ s geographical location:

Referenced AWI quality standard including Section 100-S-3 “Moisture Content”.

WARRANTY

General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

Door Manufacturer’s Warranty: Submit written agreement on door manufacturer’s standard form signed by Manufacturer, Installer and. Contractor, agreeing to repair or replace

defective doors that have warped (bow, cup or twist) or that show telegraphing' of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

Warranty shall also include reinstallation, which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

Warranty shall be in effect during following period of time after date of Substantial Completion.

Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART TWO - PRODUCTS

MANUFACTURER

Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors, which may be incorporated in the work include, but are not limited to, meet this performance specifications

INTERIOR SOLID WOOD DOORS

1 ¾" thickness – Shall comply with the following requirements:

1. Engineered side stile. Still solid wood construction. No thin veneer over particle board.
2. Solid Rail Construction. Face Glue two solid boards for center stiles and horizontal rail.
3. Joints Secured by cope and stick tension.
4. Top rail joinery is double secured.
5. Hidden foam expansion inserts to allow for natural expansion and contraction of panels.
6. Panels are solid wood, no veneers.

Colors, Patterns, and Finishes: Selected by Architect and Owner.

FABRICATION

Fabricate flush wood doors to sizes indicated for job-site fitting.

PART THREE - EXECUTION

EXAMINATION

Examine, installed door frames prior to hanging door

Verify that frames comply with indicated, requirements for type, size, location, and swing characteristics and have been installed with plumb jamb and level heads.

Reject doors with defects.

Do not proceed with installation until unsatisfactory conditions have been corrected.

INSTALLATION

For installation see Division-8 “Finish Hardware” section of these specifications.

Manufacturer’s Instructions: Install wood doors to comply with manufacturer’s instructions and of referenced AWI standard as indicated.

Fitting Clearances for Doors: Provide 1/8” at jambs and heads; 1/16” per leaf at meeting stiles for pairs of doors; and 1/8” from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4” clearance from bottom of door to top of threshold.

Bevel non-rated doors 1/8” in 2” at lock and hinge edges.

Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at the job site.

ADJUSTING AND PROTECTION

Operation: Re-hang or replace doors, which do not swing or operate freely.

Finished Doors: Refinish or replace doors damaged during installation.

Protect doors as recommended by door manufacturer to ensure that wood doors will, be without damage or deterioration at time of acceptance.

END OF SECTION 08200

SECTION 08500 – EXTERIOR WINDOWS

PART ONE - GENERAL

DESCRIPTION

Furnish and install all windows, window sub-frames, steel reinforcement channels, break metal mullions, and all miscellaneous aluminum framing indicated on drawings and specified herein.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions
Sealants & Caulking: Section 07900
Finish Hardware: Section 08710
Glass & Glazing: Section 08800

QUALITY ASSURANCE

Test reports certified by an independent testing laboratory must be made available upon request.

SUBMITTALS

SHOP DRAWINGS: Furnish shop drawings showing dimensions, details of construction, finish joint system, anchorage, and glazing details.

MANUFACTURER'S DATA: Cut sheets showing hardware and accessories and schedule of hardware.

PART TWO - PRODUCTS

SINGLE-HUNG WINDOWS: Shall be Brighton Series Dept; SH single-hung manufactured by Quaker Windows. Must meet egress requirements. Energy 34S (Triple Silver) Argon Filled; pre – painted interior, muntin SDL 7/8". Pull handle on bottom. 4 9/16" Jamb Depth. Rating – DP-25, U- factor 0.31, SHGC 0.17.

HEAD/JAMB CLOSURE: This will be included

SUB SILL: This will be included.

FRAME: Color by Architect (White)

FINISH: Shall be fluoropolymer Duranar coating.

ALLOYS: Aluminum shall be commercial quality and of proper alloy for window construction free from defects impairing strength and durability. All extruded sections shall be of 6063-T5 alloy temper, and shall have a minimum ultimate tensile strength of 22,000 psi and a yield of 16,000 psi.

WINDOW MEMBERS: Main frame and sash members shall have a nominal wall thickness of not less than .062" except for fin trim either integral or applied. Frame sill member shall have a nominal wall thickness of .078". The standard wall thickness tolerances as defined by the Aluminum Association shall apply. The main frame shall be no less than 3 5/32" in depth. The primary inserts shall be of tubular extruded horizontal sections and shall be no less than 7/8" in depth or height.

FASTENERS: All screws and other miscellaneous fastening devices incorporated in the product shall be of aluminum, stainless steel, or other non-corrosive material compatible with aluminum.
Cadmium or zinc-plated steel, where used, shall be in accordance with ASTM A-I65 or B-633.
Nickel or chrome plates steel, where used, shall be in accordance with ASTM B-456-79.

HARDWARE: Hardware having component parts which are exposed shall be of aluminum, stainless steel, or other non-corrosive material compatible with aluminum. Cadmium or zinc-plated steel, where used, must be in accordance with ASTM A-164-71 or A-165-71.

WEATHER-STRIPPING: Weather-stripping shall meet the specification as detailed in the appropriate test report. All weather-stripping shall be installed so that there is no metal-to-metal contact between the master frame and the operating sash. All weather-stripping shall be installed in specially extruded ports and secured to prevent movement, shrinkage, or loss when removing sash both for cleaning or repair, and during normal sash operation. Weather-stripping, where used, must conform to AAMA Specification 701.2

ASSEMBLY: The windows shall be assembled in a secure and workmanlike manner to perform as herein specified and to assure neat and weather-tight construction.

MAIN FRAME: All joints of the frame shall be of butt type construction joined neatly and secured by means of two (2) screws in each corner anchored in integral screw ports. The main frame at the junction of the sill and jamb frame shall be sealed on

the outside with a good grade of sealant, meeting the requirements of AAMA 803.3.

INTERIOR TRIM: Interior trims, closures, angles, etc., if used, shall be specified or detailed of extruded shapes with a wall thickness of no less than 0.050" and 6063-T5 aluminum alloy and temper. Snap trim dimensions will be in accordance with dimensions as furnished in the architectural details, On all interior trim, no exposed fasteners shall be allowed.

Corners shall be firmly jointed in a secure and workmanlike manner, utilizing staked-in-place cast corner keys. Frames shall be of sufficient rigidity and cross-braced as required to lie flat against the window and prevent excess bow in frame members and sag in screening.

GLAZING shall be Cardinal LowE 366 – DSB Clear, factory glazed. Strength: Annealed Glass.

PART THREE - EXECUTION

INSPECTION

Examine openings and surfaces to receive this work and determine that dimensions, elevations, and slopes of connecting work will insure a satisfactory installation.

Do not proceed with installation until all discrepancies are corrected.

PREPARATION

Dissimilar Materials: Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials. Separate by use of gaskets or coat of bituminous paint.

INSTALLATION

Install framing members, doors, and field applied hardware in accordance with manufacturer's approved shop drawings and recommendations in prepared openings.

Provide and install all clips, brackets, hardware closure trim, and metal shapes to provide for complete installation.

Set members plumb, level, square, at proper elevations and in alignment with other

work without warp or rack of frames or panels.

Accurately cut and fit materials, assemble with snug hairline joints, and anchor securely in place. All cut and machined ends and recesses shall be true and accurate and free of burrs or rough edges.

Set sill members and other members in a bed of sealant compound or with joint fillers or gaskets to provide weather-tight construction.

Sealant: By installer of aluminum entrances and storefronts. Sealant lines to be straight, neat, and thin (1/4" max. width). Finished joints to be recessed.

Clean aluminum surfaces promptly after installation.

Install hardware required for entrance doors. Verify proper operation of all moving parts. Adjust as required. Protect hardware until acceptance of building. Set each edge of thresholds in strip of sealant compound.

Install steel reinforcement in mullions of 8" wall system to resist wind load & eliminate deflection.

END OF SECTION 08500

SECTION 08710 - FINISH HARDWARE

PART ONE – GENERAL

DESCRIPTION

Furnish and deliver to job finish hardware for all doors as scheduled and specified herein including, but not limited to, thresholds and weather stripping for exterior hinged doors: strikes, screws and accessories necessary for complete installation.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions
Rough Hardware: Section 06100
Installation: Section 06200

QUALITY ASSURANCE

Manufacturer: Catalog numbers specified herein have been used for the purpose of establishing a basis for quality, finish, design and operational function. In order to establish such a basis for quality, certain processes, types of equipment and of material are specified by manufacturers brand or catalog number. Items of equal quality, by other manufacturers, approved in writing by Architect, acceptable.

Hardware supplier to maintain an office and warehouse within 100 miles of the jobsite in order to properly service the job.

Supplier to have a full time Architectural Hardware Consultant (A.H.C.) employed to adequately service job. This individual will be required to make a minimum of (2) visits to jobsite. One visit will be required at or near completion of job to check & verify installation of hardware and correct or make any necessary adjustments. This visit should include a meeting with the University to explain functions of any special items furnished. Deliver at this time (2) copies of final finish Hardware Schedule for future use of the University. A letter from this supplier verifying compliance with the above will be required to complete this contract.

SUBMITTALS

Hardware Schedule: Submit hardware schedule showing quantities, types, catalog numbers, keying system and location of various items. Compile in a manner to serve as installation guide.

Samples: To be submitted, if requested by Architect, for purpose of verifying designs, finishes and operating characteristics

Templates: Furnish, as required to manufacturer of doors and frames.

Manuals & Tools: Furnish Owner, with manufacturer's instructions for installing, operating and maintaining finish hardware upon completion of work. Deliver to Owner all installing, adjusting and maintaining tools normally supplied with hardware by manufacturers for proper operation and maintenance.

STANDARDS

A. Conform to latest requirements and recommendations of applicable portions of standards listed.
B. UL label doors and smoke doors in accordance with the applicable requirements of NBFU Pamphlet No. 80 and NFPA Standard No. 80.
C. American Society of Architectural Hardware Consultants - ASHAHC.
D. United States of American Standards Institute - A.S.I.

UNDERWRITER'S LABORATORIES REQUIREMENTS

All items of hardware provided for fire doors shall be UL approved for usage with types and sizes of fire doors and frames specified. All fire door installations shall, when completed, meet the requirements of the appropriate insurance inspection and rating bureaus, and shall not be subject to any rate penalty for the Owner.

PRODUCT DELIVERY STORAGE & HANDLING

Deliver hardware to project in manufacturer's original, unopened, labeled packages or containers. All items of hardware shall be properly marked or tagged according to building number, hardware item number, door number and location prior to arrival on job site so as to conveniently identify the hardware and its intended location in the building. Under no circumstances shall hardware be shipped directly from factory to project.

Store hardware items in manner to avoid damage to materials and in approximate order of use to avoid excessive re-handling.

Damage of any items of hardware in shipment, or any item that may be defective, and not in compliance with specifications, shall be replaced promptly.
All locks to have interchangeable core cylinders set to GMK & Master key as directed.

END OF SECTION 08710

SECTION 08800 - GLASS AND GLAZING

PART ONE - GENERAL

DESCRIPTION

Provide all items of glass as shown on drawings and specified herein.

RELATED WORK SPECIFIED ELSEWHERE

Steel Doors and Frames: Section 08100
Plastic Clad Wood Doors: Section 08211
Aluminum Entrances, Fixed Windows & Storefronts: Section 08500

OUALITY ASSURANCE

Regulatory Agencies:

Manufacturer of glass and glazing materials and fabrication and installation of glazing materials, shall meet the requirements of the Safety Standard for Architectural Glazing Materials (16 CFR Part 1201) dated January 6, 1977, effective July 6, 1977, issued by the Consumer Product Safety Commission.

Recommendations of the “Glazing Manual” of the Flat Glass Marketing Association are by reference made a part of this specification.

Provide safety glass, at no cost to the Owner, and whether shown on drawings or not, at all areas required by Local, State, or National Codes and Standards.

Product Identification: Labels showing manufacturer’s identity, type, thickness, and quality required on each piece of glass. Labels to remain on glass until it has been set and inspected, except safety glazing panels. Safety glass (wire, tempered, laminated) shall be permanently labeled in accordance with the referenced act.

Acceptable Manufacturers: Except as otherwise scheduled below, all glass shall be as manufactured by PPG Industries, LOF Industries, American-St. Gobain, or Globe Amerada.

SUBMITTALS

Shop Drawings: Sections and details of glass installation at framing members such as head, mullions, transoms, jambs, and sills.

Certificates: If required by Architect, manufacturer's certification that all materials meet specification requirements.

PRODUCT DELIVERY, STORAGE, AND HANDLING

Receive, store, and handle glass items in manner to prevent damage and insure satisfactory installation.

JOB CONDITIONS

Coordinate installation scheduling with Contractor. Perform work when ambient temperature is above 40 degrees F.

Perform glazing on dry surfaces only.

PART TWO - PRODUCTS

MATERIALS

General: All glass or polycarbonate shall be thickness as shown on drawings. Any areas not indicated shall be minimum 1/4" thick laminated safety tinted glass. Verify with Architect prior to ordering material.

All tempered glass shall be horizontally tempered showing no tong marks.

Glass Types: See drawings and or required by code.

Doors and Interior Windows: 1/4" thick fully tempered grey tinted float glass unless indicated on drawings otherwise or as indicated on drawings.

Doors and Interior Windows: 1/4" thick clear polished wired glass unless indicated on drawing otherwise.

Glazing Gaskets: Molded or extruded neoprene gaskets of the profile and hardness required for watertight construction; comply with ASTM D-2000, color to match adjacent aluminum surfaces.

Setting Blocks and Spacers: Neoprene, as recommended by manufacturer of glass, chemically compatible with sealant used.
Other Accessories: glazing points, wire spring clips, filler rod, primer-sealer and cleaners, shall all be as recommended by glass manufacturer.

Ferrous metal accessories which will be exposed in the finished work shall have a finish that will not corrode or stain while in service.
Other materials which will be exposed to view and unpainted shall be gray or neutral color.

Verify with other sections as to type of glazing compound required.

PART THREE - EXECUTION

Check that glazing channels are free of burrs, irregularities and debris.

Check that glass is free of edge damage or face imperfections.

Do not proceed with installation until conditions are satisfactory.

Verify dimensions shown on drawings with field measurements. Compute actual glass size, allowing for edge clearances.

Remove lacquer from metal surfaces wherever elastomeric sealants are used. Clean glass and glazing surfaces to remove dust, oil and contaminates, wipe dry. Do not set glass in steel or wood frames until frames have been primed and paint is dry. Surfaces to receive glazing compound shall be primed in accordance with recommendations of manufacturer of glazing compound.

INSTALLATION

Items to be glazed may be shop or field glazed, using glass of the quality and thickness indicated. Preparation of surrounds and glazing, unless otherwise specified, shall be in conformance with the details and general conditions governing glazing in the FGJA Glazing Manual.

Accurately size glass, set without springing and install securely to prevent rattling or breakage.

Gasket Glazing: Glass in aluminum framing and entrance doors shall be set in glazing gaskets and aluminum beads in compliance with framing and entrance door manufacturer’s shop drawings and instructions and as specified herein. Cut gaskets to length of channel with mitered corners. Place glass on setting blocks and center horizontally.

ADJUST AND CLEAN

Inspect prior to final cleaning. Remove and replace broken, scratched, or otherwise damaged glass at no expense to Owner.

PROTECTION OF COMPLETED WORK

Attach crossed streamers away from glass face.

Do not apply markers to glass surface.

Replace damaged glass.

END OF SECTION 08800

SECTION 09250 – GYPSUM DRYWALL

PART ONE - GENERAL

DESCRIPTION

Furnish and install all gypsum drywall systems complete with partition framing, bracing, and related accessories as shown on drawings and specified herein including all wall and ceiling anchors for items furnished under other sections.

Also included are control joints, expansion joint assemblies and metal molding metal “2” clips.

Corner beads shall be furnished and installed under Painting: Section 09900.

Install wall batt insulation as specified in another section.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions
Insulation: Section 07210
Acoustical Ceilings (Suspended): Section 09510
Taping, Floating & Painting: Section 09900

QUALITY ASSURANCE

Material and manufacturer’s specification referenced are based on United States Gypsum
Company. Equivalent systems and materials as manufactured by Flintkote, Georgia-Pacific or National Gypsum are acceptable. Latest edition of manufacturer’s specifications shall apply.

Gypsum drywall used in fire rated assemblies shall bear Underwriter’s Laboratories label.

SUBMITTALS

Samples: Submit samples of all trim and accessory items to Architect for approval.

Certificates: Furnish certificates that fire rated, water repellant, and sound control wallboard comply with respective codes and standards.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver materials to job site in original, unopened containers or bundles, with labels intact. Handle with care to prevent damage.

Store materials inside, under cover. Stack flat, off floor.

JOB CONDITIONS

Maintain uniform building temperatures within 55 degrees - 70 degrees F. range for 24 hours before, during and after gypsum drywall application and joint treatment.

Provide adequate ventilation.

Protect adjacent surfaces against damage and stains.

PART TWO - PRODUCTS

MATERIALS

METAL STUDS: Shall be fabricated of electro-galvanized steel, sizes as shown on drawings or as called for herein, complete with galvanized floor and ceiling runners of proper size and type furnished by the stud manufacturer. All studs up to 4" size shall be 25 gauge; 4" studs shall be 20 gauge. 6" studs shall be 18 gauge, 8" structural studs shall be 14 gauge @ stone veneer.

STRUCTURAL STUDS: load bearing shall be 14 gauge galvanized steel, unless otherwise indicated on drawings, complete with galvanized runners. Steel shall meet requirements of ASTM A-570-66T, except shall be 50,000 psi.

FURRING MEMBERS: Shall be 25 gauge electro-galvanized steel.

HANGER & TIE WIRES: Shall be 8 gauge galvanized wire for hangers; 16 gauge galvanized annealed wire for ties.

RUNNER CHANNELS: 1 1/2", cold rolled, weighing .475 lbs. per foot.

GYPSUM BOARD: Shall be 5/8" thickness, conform to ASTM C-36-67 SW edge, tapered edge 48" width length as long as possible to reduce joints below ceiling. Provide 5/8" Fire Code Type X, 5/8" WR, and 5/8 WRX as indicated on drawings and schedules.

WR CEMENT BOARD: Shall be water resistant green board in all wet areas, i.e., showers, toilets, restrooms, mech. and jan./laundry. 7/16" Hardi board or Durock. 5/8" shall be used behind stone veneer.

FASTENERS: Type “S” screws to drywall metal framing.

ACCESSORIES & CONTROL JOINTS: Metal trim, “J” mould and expansion joints as recommended by manufacturer. Provide expansion joints spaced according to manufacturers recommendation and as indicated on drawing and details. Provide expansion joints above all windows and doors or as indicated on architectural plans.

INSPECTION

Do not proceed with installation until deficiencies are corrected.

INSTALLATION

Install metal framing systems in accordance with manufacturers printed or written instructions and recommendations, unless otherwise indicated.

Steel framing shall be fireproofed - Provide and install metal “2” clips at steel for bracing & partition tracks:

METAL STUDS: All stud configuration, locations and attachments as indicated on drawings.
Accurately align runners at bottom and top, and securely anchor with suitable fasteners not over 24” o.c.

Studs shall be spaced 16” o.c.

All interior partitions shall be gauged by the metal stud size. (See drawings)

All exterior wall studs shall be 16 ga. structural metal studs.

Provide horizontal channel continuous on studs just above ceiling line. Install channel bracing 6’-0” o.c. maximum, from horizontal channel to the structure above at a 45 degree angle each way. Provide same type 45 degree bracing at both sides of all openings.

Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls.

FURRING MEMBERS: Shall be spaced 24” o.c. and attached vertically or horizontally to masonry, concrete or steel surfaces with hammer-set or power-

activated stud fasteners, concrete stud nails, or self tapping screws spaced 24" o.c. through alternate wing flanges of furring channels.

WALL OPENINGS: Frame wall opening larger than 2'-0" square (including all doors) with double structural studs at each jamb and head of frame. Provide 45 degree bracing at both sides of all openings.

Provide all chases, holes, etc. needed for Mechanical Contractor and Electrical Contractor. All work shall be included in this section.

Install batt insulation specified in Section 07200 in cavity of all metal studs that is indicated in specifications or drawings.

Provide double 16 ga. studs each side all openings.

Provide bracing to structure above at each corner of every door frame. Brace back at 45 degree angle each side of partition.

When fire-rated assemblies are required, use only materials and methods of construction conforming to requirements of indicated design. Extend wall & finish to deck above. Provide continuous runner below ceiling line and brace back at 45 degree angle to structure above at 6'-0" on center max.

Provide continuous "J" mould at each side of partition where it connects to ceiling system.

Control Joints: Install control joints (USG #093 only-no vinyl joints will be accepted) where shown on drawings. If none is indicated on the drawings, install joints at 16'-0" o.c. maximum in both walls and soffits. Verify exact locations with Architect.

Install control joints above each side of frame where gypsum board occurs above doors.

Install control joints above & below each side of frame where gypsum board occurs above doors.

Expansion Joint Assemblies: Install expansion joint assemblies where shown on drawings. Coordinate location with floor and ceiling joints installed by other trades to insure proper alignment. Install joints plumb.

Quality of workmanship throughout shall be the best. Make all angles and corners clean, true, plumb and square; walls plumb, flat and straight; ceiling flat & level.

Supports for Plumbing Fixtures: For the support of all wall hung plumbing fixtures, provide 14 gauge steel plates, bent on each end and secured at each end to the studs with bolts. Depth of plates shall be as required to accommodate the fixture hanger plates or other support devices which are generally furnished with the fixture.

CLEANING & PROTECTION

Remove drywall rubbish from floor, leaving entire work in first-class condition.

Protect exposed finished surfaces from stains due to droppings and dirt normal to this operation.

SCHEDULE

See drawings for types and locations of partitions and ceiling assemblies and systems.

END OF SECTION 09250

SECTION 09300 – TILE

PART ONE - GENERAL

DESCRIPTION

Provide tile to complete the work as shown on the Drawings and specified herein including, but not limited to:

Setting and leveling beds.

Surface bullnose, marble threshold, wainscot cap, coved and bead pieces as required.

Silicone joints at perimeter of all floor areas.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:

SUBMITTALS

Furnish Master Grade Certificate signed by both tile manufacturer and tile subcontractor.

Submit manufacturers samples for Architect's selection. Obtain approval of job sample submittals before delivering any products to job site.

Submit tile manufacturer's maintenance guides for Owner's use in maintaining all ceramic tile work herein specified.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver all products to job site in manufacturer's unopened containers with grade seals unbroken and labels intact.

Keep tile cartons dry.

Maintain temperature at 50 degrees F. minimum during tilework and for 7 days after completion. Vent temporary heaters to outside to avoid carbon dioxide damage to new tile work.

PART TWO - PRODUCTS

MATERIALS

CERAMIC TILE: Provide 24" x 36", 12" x 24", 6" x 36" (Discover) style manufactured by MileStone as indicated on finish schedule / elevations. Colors shall be selected by owner / architect.

BACKSPLASH: Provide4" x 8" & 2" x 11" (Havana Brick), Melecon style manufactured by Mediterranea as indicated on finish schedule / elevations. Colors shall be selected by owner / architect. Grout – Sahara Biege (40)

MARBLE THRESHOLD: Furnish and install handicap marble threshold where ceramic tile joins different type floor covering. Marble shall be thickness and length required, white marble with blue-gray cloud markings. Width for required handicap slope at change in floor elevation.

EXPANSION JOINT MATERIAL: Provide expansion joint material in the floor finish over saw-cuts in the slab. Match color with mortar.

SETTING MATERIALS:

Portland Cement: ASTM C-l50, Type 1, gray color.

Hydrated Lime: ASTM C-206 or C-207, Type S.

Sand: ASTM C-144

Water: Clean and drinkable.

Dry-Set Mortars: ANSI A118.l.

EXPOXY GROUT/SEALANT:

EPOXY type, 40 colors as selected by Architect. (SPECTRALOCK PRO Premium Grout or an approved equal)

- Stainproof
- Non-sag formula for walls and floors
- Uniform color—no blotchiness or shading
- Easy to maintain, cleanable to the original color
- Performance requirements of ANSI A118.3

- 80 minutes working time at 70°F (21°C)
- Inhibits the growth of stain-causing mold and mildew in the grout joints with Microban® antimicrobial product protection
- Tough, durable, and crack resistant

PART THREE - EXECUTION

INSPECTION OF SURFACES

Before tiling, examine surfaces to receive ceramic tile, setting beds, waterproof membrane, or accessories. Report defects or conditions adversely affecting satisfactory installation to Architect for correction. Verify that deviation in surfaces to receive tile are within allowable tolerances. Level as required to meet requirements. Commencement of work indicates acceptance of surfaces.

LAYOUT (See floor & wall patterns)

Floor and wall joints to line.

Lay out all tile work to minimize cuts less than one-half tile in size.

Locate cuts in both walls and floors to be least conspicuous.

Align wall joints to give straight, uniform grout lines

Align wall joints to give straight, uniform grout lines parallel to wall. Floor and wall joints to line.

Make joints between tile sheets same width as within sheets.

Do not lay tile continuous over expansion or construction joints in concrete slab. Break and provide proper expansion tile control.

Install tile in strict conformance with applicable requirements ot latest edition of ANSI Standard A108--I and Al 08.5 and TCA Handbook.

Fit tiles close around plumbing pipes, fixtures and fittings so that plates or collars will overlap the cut edges.

Do all leveling as required with back-up material. Slope floors to drains and other areas as required. Prepare existing surfaces as required to receive tile materials.

Provide layout on floors and walls as indicated on drawings.

CLEANING

Clean tile surface as thoroughly as possible on completion of grouting.

Remove all grout haze, observing both tile and grout manufacturers recommendations as to use of acid and chemical cleaners.

Rinse tile work thoroughly with clean water before and after chemical cleaners.

Polish surface of tile work with soft cloth.

Protect finish metal surfaces with vaseline where acid cleaning solutions are used.

PROTECTION

Apply to all clean, completed tile walls and floors a protective coat of neutral cleaner solution, part cleaner to 1 part water.

In addition, cover all tile floors with heavy-duty, non-staining construction paper, masked in place.

Prohibit all foot and wheel traffic from using newly tile floors for at least 3 days, preferably 7 days.

Just before final acceptance of tile work, remove paper and rinse protective coat of neutral clear from all tile surfaces.

END OF SECTION 09300

SECTION 09510 – ACOUSTICAL PANEL CEILINGS

PART ONE - GENERAL

DESCRIPTION

Provide acoustical ceilings complete with exposed grid suspension system, lay-in panels and related accessories as shown on drawings and specified herein. Coordinate and provide necessary components as required on Reflected Ceiling Plans in Electrical Section of Drawings.

Install insulation above all new ceiling system as specified in another section.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Building Insulation: Section 07210
Gypsum Drywall Systems: Section 09250
Heating, Ventilating and Air Conditioning: Division 15
Electrical: Division 16
Reflected Ceiling Plan: Refer to Architectural & Electrical Drawings.

OUALITY ASSURANCE

Qualifications of Installer: Installation shall be by an authorized installer approved by acoustical material manufacturer using only skilled mechanics specializing in this type of work.
Responsibility: All acoustical work, including that specified in other sections, shall be subcontracted to a single firm responsible for all acoustical ceiling work, even though some parts may be sub-subcontracted to others.

Tolerances: Finish acoustical ceiling system shall be level to within 1/8" ± (1/4" maximum) in 12 feet.

Suspension system components, hangers and fastening devices supporting light fixtures, ceiling grilles and acoustical units: Maximum deflection 1/360 of span.

Fire Hazard Classification (Acoustical Materials: Federal Specification SS-S-1 1 8A, Class *25.*

Fire Endurance Ratings: Fire rated ceiling assemblies shall conform to Underwriters' Laboratories, Inc., requirements for the appropriate Time-Design-Rated Assembly.

Openings shall comply with NFPA Pamphlet 90A requirements.

Should the methods of installation indicated on the drawings or described herein be at variance with the requirements of U.L. and NFPA, they shall be revised to meet requirements.

SUBMITTALS

Samples: Submit two full size samples of each type of acoustical material.

Submit one full size sample of each suspension system member, molding and hangers.

Manufacturer's Literature: Submit for review of Architect the manufacturer's recommendation for installation of suspension system.

Certificates: Furnish certification of materials and systems conforming to specification requirements.

Furnish certification of fire endurance rating and flame spread index of fire rating organization.

Maintenance Material: Furnish extra materials equal to 1% of each type of acoustical material supplied, for replacement/maintenance purposes.

Furnish suspension system components in amount sufficient to install extra ceiling units.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver materials in original, unopened, protective packaging, with manufacturer's labels
indicating brand name, pattern, size, thickness and fire rating as applicable, legible and intact.

Store materials in original protective packaging to prevent soiling, physical damage or wetting.

Do not begin installation until sufficient materials to complete a room are received.

JOB CONDITIONS

Temperature and humidity conditions shall approximate occupied building conditions prior to, during and after installation.

SUSPENSION SYSTEM

General: Suspension system shall be an exposed “T” bar grid and shall comply with ASTM C635, “Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings”. System shall be classified intermediate-duty. Provide system components from single manufacturer. Approved manufacturers of Armstrong, Donn Corp. and Chicago Metallic Corporation.

Main, Cross & /Concealed Members: Double web, cold rolled aluminum, minimum thickness 0.02 in., with a standard factory painted satin white finish. Exposed flange 15/16” width.

Edge Molding: Cold rolled, 0.02 in. thick, aluminum, angle, factory painted satin white finish, 15/16 in. wide exposed leg.

Hanger Wire: Minimum 12-gage, galvanized, soft annealed, steel wire.

Furring Channels: ASTM C645.

PRODUCTS

ALUMINUM GRID: White AL Prelude Plus XL 15/16” (Model HD8201WA) Exposed Tee system manufactured by Armstrong or equal by Chicago Metallic Corporation.

ACOUSTICAL CEILING (ACT-1): Furnish 24” x 24” x 1”, Armstrong – (Calla Item #2822 or an approved equal. Install per finish schedule.

ACOUTICAL CEILING (ACT-2) Furnish 24” x 24” x 1”, Armstrong – (Cortega Item #816 or an approved equal. Install per finish schedule.

ACOUSTICAL CEILING (ACT-3): Furnish 24” x 24” x 5/8”, Armstrong – (Ceramaguard), #607 or an approved equal. Install in all restrooms, IT room, & janitor.

Examine areas scheduled to receive suspended, exposed grid ceilings. Verify that conditions are satisfactory to install ceiling in compliance with contract requirements, particularly adequate clearances at ductwork, piping and conduit to maintain scheduled ceiling heights. For a complete system.

Verify acceptable limits of temperature and humidity conditions.

Do not proceed until all unsatisfactory conditions have been corrected.

PREPARATION

Lay out ceiling pattern based on the contract drawings and the approved ceiling pattern layout.

Unless otherwise indicated, lay-out ceilings working both ways from e principal axes of each area to provide symmetrical patterns.

Coordinate the suspension systems with all electrical and mechanical penetrations, such as light fixtures, access panels and grilles.

INSTALLATION

General: Install acoustical ceilings and suspension system in strict compliance with manufacturer's recommendations, ASTM C636, approved shop drawings, and as specified herein.

SUSPENSION SYSTEM:

Space hangers 2 ft. o.c., each direction.

Install additional hangers at ends of each suspension member. Install additional hangers at each corner of 2'0" x 2'0" openings for light fixtures and additional hangers as required for additional weight of other items. Install hangers 6" from vertical surfaces.

Where duct work, equipment or similar items prevent direct hanging from structure, provide steel channel bridging suspended below such items for hanging necessary wires to runners.

Do not splay wires more than 5 in. to a 4 ft. vertical drop.

Wrap wire a minimum of three times horizontally, turning ends upwards.

Space main runners 4'0" o.c. maximum with hanger wires 4'0" o.c. max. Level and square to adjacent walls.

Space cross runners as required for size of acoustical units.

Install system to permit border units of the greatest possible size. Minimum width of

border shall be one-half unit.

Provide system to permit border units of the greatest possible size. Minimum width of border shall be one-half unit.

Provide edge molding at intersection of suspended ceiling and vertical surfaces. Miter corners where edge molding intersect.

Install aluminum grid at all areas scheduled to receive moisture resistant ceiling system.

ACOUSTICAL UNITS:

Install acoustical units to bear on suspension members at all sides.

Install spring spacers at wall molding to hold acoustical unit snug on flange of wall molding.

Seal joints in acoustical units around pipes, ducts and electrical outlets with caulking compound.

Install 6" batt insulation above all ceiling unless noted otherwise.
Install protective board at light fixtures for required 1-hr. rating.

ADJUSTING & CLEANING

Adjust suspension system to assure level ceiling.

Clean adjoining painted surfaces of soil marks resulting from this installation.

Clean soiled or discolored surfaces of tile units following installation.

Touch up scratches, abrasions, voids and other defects in painted surfaces.

Remove and replace damaged or improperly installed units.

END OF SECTION 09510

SECTION 09900 – PAINTING

PART ONE - GENERAL

DESCRIPTION

Provide painting for all exposed interior and exterior surfaces, including items on roof, unless specifically excluded. Surfaces include but are not limited to:

All exposed steel in the pavillion shall be painted. This includes purlins, bents, girts, all exposed miscellaneous exposed steel, hvac ductwork and rigid frames. Colors shall be selected by Architect.
All electrical conduits and exposed wire mould shall be painted to match wall color.
All roof penetrations shall be center in the roof panel. All penetrations shall be painted.
Painter shall provide colored caulk @ door frames (frame meeting floor)
Structural Steel.
Miscellaneous metal fabrications.
Galvanized metal and other sheet metal. (All exposed ductwork)
Rooftop mechanical equipment.
Hollow metal work.
Concrete masonry.
Painted wall graphics, striping & logos.
Back priming of wood.
Doors & frames.
Exposed wood.
Texturing and painting gypsum board.
Exposed conduit, piping (including copper), hangers, supports and fasteners, and ductwork.
Cast iron piping, where exposed.
Items which have received a factory prime or shop coat finish.
Surfaces, including interiors of ducts, behind grilles or any other form of construction which will be visible from any angle.
Interior and exterior plaster.
Provide and install all metal corner beads for taping and floating drywall.

DEFINITION

The terms “paint” or painting” as used in this section in a general sense have reference to sealers, primers, stains, oil, alkyd, latex, polyurethane, and enamel-type paints and the application of these materials.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions
Cast-In-Place Concrete: Section 03300
Membrane Waterproofing: Section 07110
Gypsum Drywall Systems: Section 09250

OUALITY ASSURANCE

Workmanship: All workmanship is to be of the very highest standard with all materials evenly spread and smoothly flowed on without sagging, runs, or other defects affecting the utility or appearance of the work.

Materials applied with inferior workmanship shall be removed and reapplied in an acceptable manner, at no additional cost to Owner or Architect.

Unless specified otherwise, all materials shall be of the best grade of first line paint. Products equivalent to those specified and manufactured by the following manufacturers are acceptable: PPG Industries, Sherwin Williams, & Tnemec or approved equal.

SUBMITTALS

Color Samples: Furnish Architect a complete range of color samples, in duplicate, of products to be used for preparation of color schedules. Architect will provide complete schedule of colors.

This subcontractor shall then prepare samples at the job as required until the colors and textures are satisfactory. Subcontractor will submit shop drawings on all paints.

Certificate: Furnish paint manufacturer's certification that all paint materials proposed for use or the project are the best grade of first line products.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver materials in original, unopened containers with contents labeled. Keep space used for storage of equipment and materials in clean and orderly condition. Keep all waste and paint rags in metal containers, tightly covered or safely disposed of at end of each working day. Take every precaution to avoid fire. Provide approved type of fire extinguisher immediately outside each paint storage space.

JOB CONDITIONS

Coordinate with other trades to insure adequate illumination, ventilation and dust-free environment during application and drying of paint.

Maintain temperature and humidity within manufacturer's recommend tolerances. In the absence of specific instructions by manufacturer to the contrary, exterior painting shall not be done during cold or damp weather nor when the temperature is likely to drop below 32 degrees F. during the curing cycle of the applied finish.

ADDITIONAL PAINT

Provide Owner, at completion of job, one unopened gallon of paint each color selected, in tightly sealed containers labeled with color sample and a list of room numbers where used.

PART TWO - PRODUCTS

MATERIALS

Compound for Gypsum Wallboard Texture: Vinyl bound aggregated texture material in powdered form, mixed with water to produce a rough sand finish effect.

Texture:Texture grade selected by Architect.

Paint Materials: Finish coats to be from same manufacturer wherever possible. Base and intermediate coats shall be products recommended by manufacturer of finish coat. Refer to Paint Schedule for materials.

Gypsum Wallboard Treatment Materials

Joint Tapes: Plain or perforated ASTM C-475.
Corner Beads: Galvanized steel nailed to framing thru panels.
"Dur-a-bead" (U.S.G.) or "Standard Corner Bead" (Nat'l. Gyp.)
Compound for Embedding: ASTM C-475.

Joint Treatment: USG Perf-A-Tape System. Provide U.S.G. Ready-Mix components at gypsum board panels.

INSPECTION OF SURFACES

Before starting any work, inspect surfaces to receive paint finishes for defects which cannot be corrected by the usual puttying and sanding and cleaning, and which would prevent satisfactory results. If such defects are discovered, notify the Contractor and await corrective action.

Commencing of work constitutes acceptance of surfaces and thereafter this Contractor shall be fully responsible for satisfactory work.

SURFACE PREPARATION

1) Aluminum
Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

2) Block (Cinder and Concrete)
Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75°F.The pH of the surface should be between 6 and 9,unless the products to be used are designed to be used in high pH environments such as Loxon. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a patching compound such as ConSeal.

3) Brick
Must be free of dirt, loose and excess mortar, and foreign material. All brick should be allowed to weather for at least one year followed by wire brushing to remove efflorescence. Treat the bare brick with one coat of Loxon Exterior Acrylic Masonry Primer, or Loxon Conditioner.

4) Cement Composition Siding/Panels
Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9,unless the products to be used are designed to be used in high pH environments such as Loxon.

5) Drywall (Interior and Exterior)
Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

6) Exterior Composition Board (Hardboard)
Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

7) Galvanized Metal
Allow to weather a minimum of 6 months prior to coating. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner, then prime as required. When weathering is not possible or the surface has been treated with chromate's or silicates, first Solvent Clean per SSPC-SP1 and apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

8) Plaster
Must be allowed to dry thoroughly for at least 30 days before painting. Rooms must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1-pint household vinegar to 1 gallon of water.Repeat until the surface is hard, rinse with clear water and allow to dry. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments.

9) Previously Coated Surfaces
Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

10) Solvent Cleaning
Solvent Cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No. 1. (SSPC-SP1)

11) Hand Tool Cleaning

Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before hand tool cleaning, remove visible oil, grease, soluble residues, and salts by the methods outlined in SSPCSP1. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No. 2 (SSPC-SP2)

12) Power Tool Cleaning
Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before power tool cleaning, remove visible oil, grease, soluble residues, and salts by the methods outlined in SSPCSP1. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.3.(SSP-PC3)

13) Stucco
Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products to be used are designed to be used in high pH environments such as Loxon.

14) Wood (Exterior)
Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

15) Wood (Interior)
All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating.

16) Vinyl Siding
Vinyl siding must be cleaned thoroughly by scrubbing with a warm, soapy water solution. Rinse

ADDITIONAL PREPARATION OF SURFACES

Surfaces to which paint is applied shall be dry and clean. Patch or fill as required. Wash metal surfaces thoroughly with benzine or mineral spirits before applying paint materials and clean galvanized iron thoroughly with solvent or zinc phosphate

pretreatment solution.

All woodwork and cabinets receiving paint or transparent finishes shall be sandpapered before priming and between each coat, to produce a smooth finish, free from scratches and brush marks.

After surfaces have been primed, apply putty or an elastic compound in all nail holes, cracks, crevices, or open joints between structural steel, miscellaneous steel or other adjoining materials. Finish putty or compound flush with adjoining surfaces. Putty shall match wood on varnished or lacquered surfaces.

After required cleaning and sanding of surfaces, should the painter or the Architect's representative find such surfaces or condition unacceptable, he shall at once stop work on this portion of the project until the faulty conditions are corrected.

Back Priming: Back prime wood material as specified in Finish Carpentry and Millwork.

Tape, float, sand and install all corner beads to properly prepare gypsum drywall partitions for required finish.

APPLICATION

Apply all paint in accordance with manufacturer's directions. Apply paint with brush or roller. No spray applications allowed unless approved in writing by Architect.

Primer/filler coat on concrete masonry units shall be applied so as to fill all pinholes, voids, cavities and the like so as to achieve a uniform finished surface on the face of all units.

The undercoats for finishes shall be tinted slightly off the shade of the final coat. Each coat shall be inspected and approved by the Architect before application of succeeding coats. This subcontractor assumes all responsibility to repaint or refinish any area in question. Paint on steel or iron shall be a different shade for each coat.

No gypsum board joint and corner treatment, painting, or special wall covering will be required above ceiling, behind built-in millwork, behind wood paneling, behind acoustical tile, ceramic tile, or in other permanently concealed locations (unless specifically called for otherwise on drawings).

lop and bottom of wood doors shall be sealed after fitting and adjusting.

TOUCH UP AND CLEAN

After completion, touch-up and restore finish where damaged and leave in good condition. Remove all unused materials and empty containers, clean paint from any surface not to be painted such as window glass, hardware, fixtures, finish floor, etc., and leave premises broom clean.

PROTECTION OF WORK

This subcontractor shall be fully responsible for the protection of his work and that of others from injury or staining. He shall provide a sufficient number of drip cloths to full protect adjacent finished work. He shall store his materials in a separate building from the one under construction.

SURFACES AND ITEMS NOT REQUIRING PAINTING UNDER THIS SECTION

Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal items, hollow metal work and shop fabricated or factory-built mechanical and electrical equipment or accessories.

Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as plastic toilet enclosures, acoustic materials, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets. Pre-finished items shall receive filed “touch-up” with same paint as original finish.

Concealed Surfaces: Unless otherwise indicated, painting is not required on wall or ceiling surfaces in concealed areas and inaccessible areas, such as foundation spaces, furred areas, pipe spaces, duct shafts and elevator shafts, as applicable to this project.

Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting except as otherwise specified.

Operating Parts & Labels: Do not paint any moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, unless otherwise indicated.

Do not paint over any code-required labels, such as Underwriter’s Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

Miscellaneous Surfaces: Do not paint concrete floors, except as scheduled otherwise, gypsum wallboard scheduled to receive other finish materials, or Pre-

Engineered Building structure and exterior wall openings except as scheduled otherwise.

PAINT SCHEDULE

The following treatment (as applicable) shall be applied to surfaces as indicated on Finish Schedule and detailed on drawings. Prime coats specified below will not be required on items delivered with prime or shop coats already applied.

Number of coats called for shall be minimum; additional coat or coats shall be applied if required to achieve satisfactory results.

APPROVED MANUFACTURER

Brand name indicated below is Sherwin Williams. Provide painting materials produced by single manufacturer. Paint supplier must submit shop drawings for each individual surface.

SCHEDULE
Interior Finishes

1. Ferrous Metal Other Than Galvanized
Primer: B66W00310 – Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
Finish: B66W00651 - 2cts-Pro Industrial High Performance Acrylic – Semi-Gloss

2. Exterior & Interior Concrete Block/Plaster (Epoxy) All Painted CMU
Primer: B42W00046 - Heavy Duty Block Filler White
Finish: B73W00361 - 2cts- Pro Industrial Waterbased Epoxy
Verify Block Filler will adhere to Dryblock CMU/Mortar for proper bridging.

3. Interior Metal Galvanized
Primer: B66W00310 – Pro Industrial Pro-Cry Universal Acrylic Primer
Finish: B66W00651 - 2cts- Pro Industrial High Performance Acrylic – Semi-Gloss

4. Interior Wood
Primer: B28W08111 – Premium Wall & Wood Primer, Interior Latex White
Finish: B34W00251 - 2cts-ProMar® 200 Interior Alkyd Semi-Gloss Extra White

5. Interior Stained Wood
Coat 1: A49H00201 – Wood Classic Interior Oil Stain
Coat 2: B26V00043 - Wood Classics® FastDry Sanding Sealer Clear

Coat 3: A66V00391 - Wood Classics® FastDry Varnish High Gloss Clear

6. Interior Gypsum Board (epoxy)
Primer: B28W02600 - ProMar 200 Zero VOC Interior Latex Primer White
Finish: B73W00361 - 2cts- Pro Industrial Waterbased Epoxy Eg-Shell

7. Interior Gypsum Board
Primer: B28W02600 - ProMar 200 Zero VOC Interior Latex Primer White
Finish: B24W02651 - 2cts- ProMar 200 Zero VOC Interior Latex Eg-Shell

Exterior Finishes
1. Exterior Metal Galvanized
Primer: B66W00310 – Pro Industrial Pro-Cry Universal Acrylic Primer Finish White
Finish: B66W00651 - 2cts-Pro Industrial High Performance Acrylic – Semi Gloss

2. Exposed Concrete Structure & CMU
Primer: A24W00300 - Loxon Concrete And Masonry Int/Ext Latex Primer White
Finish: B66W00311 - 2cts-Pro Industrial High Performance Acrylic Eg-Shell Coating

3. Exterior Ferrous Metal Other Than Galvanized
Primer: B66W00310 – Pro Industrial Pro-Cry Universal Acrylic Primer Finish White
Finish: B66W00651 - 2cts-Pro Industrial High Performance Acrylic – Semi Gloss

4. Wood
2 Coats: K33W00151 – Duration Coating Exterior Latex Satin

5. Cement Board
Primer: A24W08300 - Loxon Concrete And Masonry Int/Ext Latex Primer White
Finish: A89W01151 - 2cts-SuperPaint Exterior Latex Satin

6. Mechanical Work (Exposed on interior and exterior of buildings)

Exposed HVAC ductwork shall be painted and color selected by Architect

Exposed insulated surfaces covered with canvas, including piping, converters, expansion tanks, ductwork, etc., shall receive a sizing coat plus two (2) coats of paint.

Exposed uninsulated piping and all supports and hangers: Paint as indicated in Paint Schedule.

Exposed insulated surfaces having a vapor barrier jacket shall have a sealer and one (1) coat of paint.

Exposed hot piping shall have two (2) coats of high temperature aluminum paint suitable for 1200 degrees F.

Exposed sheet metal surfaces of ductwork and duct hangers, etc: Paint as indicated in Paint Schedule.

Equipment, such as tans, pumps, factory air handling units, motors, etc., having only factory primed finishes: Paint at indicated in Paint Schedule.

7. Electrical Work, Pipes, Boxes, Etc. (Exposed on interior and exterior of buildings)

Paint as indicated in Paint Schedule.

8. Unscheduled Surfaces

Any surface exposed to view and not scheduled in this "Paint Schedule" shall be cleaned and receive a minimum of one (1) coat of primer and two finish coats of paint of type approved by the Architect.

9. Parking Lot Striping

Coat 1: TM5626/27 – Hotline Fast Low Voc Acrylic Traffic Marking Paint
Handicap Striping – Blue
Parking Striping – Yellow
Sidewalk Edge Striping – Yellow

10. Stained Concrete

H&C Acetone Dyestain
High Polished with Diamond Cut Smoothing Heated Burned in Finish

END OF SECTION 09900

SECTION 10352 - FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and Division 1 Specifications Sections, apply to the Work of this Section.

1.2 SUMMARY OF WORK

A. Location of flagpole(s) is indicated on the Drawings.

B. Provide and install flagpole(s) and mounting system complete with all fittings and hardware as described in this Section.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical and catalog data and installation instructions demonstrating compliance with the requirements of this Section.

B. Shop Drawings: Submit shop drawings covering flagpoles and bases, showing general layout, joinery, and anchoring and support methods.

1.4 QUALITY ASSURANCE

A. Single Source: Provide each flagpole as a complete unit, produced by a single manufacturer, including fittings, accessories, bases and anchoring devices.

B. Wind Resistance: Flagpoles shall be constructed and installed to withstand a minimum 115 mile per hour (mph) wind velocity when flag is flying (in accordance with ANSI/NAAM Standard FP 1001-97).

C. Construction: Construct pole and ship to site in one (1) piece if feasible. Where flagpole is fabricated in more than one piece, provide snug-fitting, precise joints outfitted with self-aligning, internally spliced sleeve construction, to result in weather-tight, "hairline" field joints.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Ship flagpole(s) in hard fiber tubing or other protective container. Spiral wrap each pole in heavy Kraft paper prior to placing in container.

B. Flagpole(s) and all accessories shall be clearly labeled with manufacturer's identification and parts numbers, with all installation instructions intact.

C. Handle flagpole(s) and accessories carefully to prevent damage and soiling. Store in a secure area.

PART 2 - PRODUCTS

2.1 Approved Manufacturers

A. Concord Industries, Addison, TX, 1-800-527-3902 (www.flagpoles.com) (basis of specification).
B. Morgan-Francis Company, Inc., Arlington, IN, 1-800-814-9568 (www.morgan- francis.com)
C. American Flagpole, Abington, VA, 1-800-368-7171 (www.americanflagpole.com)
D. Baartol Company, Inc., Kenton, OH, 1-800-537-4143 (www.baartol.com)
E. Eder Flag Manufacturing Co., Oak Creek, WI, 1-800-558-6044 (www.ederflag.com)
F. Pole-Tech Company, Inc., E. Setawket, NY, 1-800-633-6733 (www.poletech.com)
G. Other pre-bid approved manufacturers, complying with the requirements of this Section, are acceptable. Bidders must have prior approval before bidding.

2.2 Flagpole

A. Cone tapered aluminum, fabricated from seamless extruded tubing complying with ASTM B241, of alloy 6063-T6. Wall thickness shall be 3/16" minimum (0.1875"), with tensile strength not less than 30,000 psi, and yield point of not less than 3 5,000 psi. Tubing shall be heat-treated and age-hardened after fabrication.

B. Finish: Fine, directional, mechanical satin polished, bronze anodized finish, complying with NAAM M-32 and AA M32-C12-A42. (Match existing roof metal panels)

2.3 Flagpole Mounting

A. Provide embedded, ground set mounting system using 16 gauge minimum, galvanized steel foundation tube, complete with welded steel base plate, setting plate, ground spike, wedges and sealant. Provide manufacturer's standard aluminum collar, finished to match pole and properly sized for the foundation tube.

2.4 Fittings (Flag Pole shall be able to fly two flags at one time)

A. 5" Finial Ball: 14 gauge minimum flush seam, spun aluminum, with gold anodized finish.

B. Truck: Double sheaved, ball bearing, non-fouling, revolving double-track assembly of cast metal, finished to match flagpole shaft.

C. Cleats: Provide two (2) 9" cast aluminum cleats with stainless steel fasteners, finished to match flagpole shaft.

D. Halyards: Provide two (2) continuous halyards for each flagpole, as follows:

1. Braided nylon or polypropylene rope, No. 10 (5/16" diameter).

2. Provide two (2) aluminum swivel snaps per halyard; finish shall be satin luster or chrome.

2.5 Flags

A. American Flag: Provide a 12'x 18' nylon United States Flag. (1 total)

B. Louisiana Flag: Provide a 6'x10' nylon Louisiana State Flag. (1 total)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavate to neat, clean lines in undisturbed soil. Provide forms where unstable soil is encountered. Remove loose soil, rubbish, organic material or other foreign matter from the excavated area. Moisten earth prior to placing concrete.

B. Provide concrete complying with ASTM C94, with 28 day compressive strength of at least 3000 psi, and air entrained. Place concrete immediately after mixing. Provide chuting to avoid segregation of concrete. Compact by use of vibrators. Cure concrete in accordance with ACI standards. Concrete shall be trowel finished, with positive slope for runoff to perimeter of base.

C. Install flagpole(s) in location(s) indicated on Drawings and in accordance with manufacturer's instructions. Provide positive lightning ground at each location. Prior to placement, paint portions of flagpole that shall be underground with a heavy, uniform coat of bituminous paint.

D. Unless otherwise indicated on Drawings, provide flagpoles in quantities and heights as follows:

1. Facility: One (1) flagpole with 60' installed height.

E. Upon completion of the Work, remove all excess soil, rubbish, tools and equipment from the Site and dispose of legally.

END OF SECTION 10352

ECTION 10425 – PLAQUE AND SIGNS

PART ONE - GENERAL

DESCRIPTION

Provide and install all plaque and signs indicated on drawings and specified herein.

Include all clips, supports, screws and mounting brackets for complete installation.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions

SUBMITTALS

Submit manufacturers descriptive brochures and necessary supplemental detailed information indicating quality, finishes and accessories required for complete installation.

Camera ready layout shall be prepared by the manufacturer of graphic panel directory and approved by Architect prior to fabrication.

Architect shall select colors from manufacturers full range of colors.

PRODUCT DELIVERY, STORAGE, AND HANDLING

Deliver items in manufacturers original unopened protective packaging.

Store materials in original protective packaging to prevent soiling, physical damage or wetting.

Handle so as to prevent damage to finished surfaces.

PART TWO - PRODUCTS

MATERIALS

ROOM SIGNS & Miscellaneous: Series Graphic Blast (FG) manufactured by Best Signs Manufacturing Company or an approved equivalent by Kroy or National Signage Affliates. (Provide at all rooms if not indicated) These signs have wood frame around around the signs) See architectural drawings for sizes. If not indicated, provide 4” x 8” rooms signs. (Names will be given at a later date if not shown on drawings)

Signs shall have the following characteristics:

1. Tactile characters/symbols shall be raised 1/32 inch from sign plate face [for ADA compliance].

2. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable unless it's a circle over a triangle or vice versa.

3. Text [on signs needing to comply with ADA] shall be accompanied by Grade 2 braille.

4. All letters, numbers and/or symbols shall contrast with their background – either light characters on a dark background or dark characters on a light background. Characters and background shall have matte finish.

Shall conform to ADA requirements.

BUILDING PLAQUE: Tablet to be aluminum cast. Mortar and face of raised letters are to be cast black finish and background is to be pebble texture. Background shall be sprayed with dark oxidized. Plaque shall be chemically cleaned and etched and treated with alodine. Two (2) coats of clear acrylic lacquer shall be sprayed on completed plaque. Tablet is to be 30" wide by 36" high with bevel edge border design. Letter styled shall be Craw Clarendon. Mounting attachments for mounting tablet on masonry wall shall be furnished with concealed fasteners (FMM-1). Manufactured by Metal Arts, Division of L & H Mfg. Co. & The Southwell Co. or an approved equal

Submit shop drawings of exact text and composition prior to casting.
Included on Plaque: (Provide 1 plaques)

1. Name of Building (See drawing title)
2. Citizens Progressive Bank Logo
3. Citizens Progressive on State Bank
4. Board Members – All board members and president (Names will be provided at a later date.)
5. Architects (The Architecture Alliance Group (TA2G)
6. General Contractor
7. Year Completed

PART THREE - EXECUTION

INSPECTION

Inspect surfaces to verify suitability.

Do not proceed until all conditions are acceptable.

INSTALLATION

Provide all mounting devices for complete installation.

Install all signs at all locations scheduled on Drawings.

Install all signs as per manufacturers recommendations and as indicated on drawings.

END OF SECTION 10425

SECTION 10520 – FIRE EXTINGUISHERS AND ACCESSORIES

PART ONE - GENERAL

DESCRIPTION

Provide and install all fire extinguishers, and accessories (F.E.) as indicated on drawings and specified herein.

Include all clips, supports, screws and mounting brackets for complete installation.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions

SUBMITTALS

Submit manufacturers descriptive brochures and necessary supplemental detailed information indicating quality, finishes and accessories required for complete installation.

PRODUCT DELIVERY, STORAGE, AND HANDLING

Deliver items in manufacturers original unopened protective packaging.

Store materials in original protective packaging to prevent soiling, physical damage or wetting.

Handle so as to prevent damage to finished surfaces.

QUALITY ASSURANCE

Conform to NFPA 10 requirements for portable fire extinguishers.

Provide fire extinguishers, cabinets, and accessories by a single manufacturer.

Conform to UBC 7-5 (ASTM E814-97) & UBC 7-1 (ASTM E119-97) for fire resistive wall performance where necessary.

Conform to American with Disabilities Act 1990 on maximum cabinet projection of 4” in corridors where necessary.

PART TWO - PRODUCTS

MATERIALS

FIRE EXTINGUISHERS IN CABINET: (F.E.C.) Ambassador 1017 series w/ cold rolled steel white powder coated finish semi-recessed with Cosmic 10E fire extinguisher (provide fire extinguisher red lettering and full glass with double strength glass) as manufactured by J. L. Industries. Full glass Architectural series with MP 10 manufactured by Larsen's Manufacturing shall be approved substitute. Complete with all brackets and clips for a complete installation. Verify depth of walls for correct size of cabinets.

FIRE EXTINGUISHERS: (F.E.) Cosmic 10E fire extinguishers with wall bracket as manufactured by J. L. Industries. MP 10 with wall bracket manufactured by Larsen's Manufacturing shall be approved substitute.

Provide fire cabinets & extinguishers for fire-rated walls. Fire-FX options (See Architectural Drawings)

Provide fire extinguishers w/brackets in all mechanical & electrical rooms and other areas that are indicated on drawings. If an extinguisher is not shown in the mechanical and electrical rooms, it is still required to supply them.

PART THREE - EXECUTION

INSPECTION

Inspect surfaces to verify suitability.

Do not proceed until all conditions are acceptable.

INSTALLATION

Mount head of cabinet @ 5'-0" above finish floor.

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 recommendations.

Securely fasten mounting brackets and fire extinguisher cabinets to structure, square, and plumb, to comply with manufacturer's recommendations.

END OF SECTION 10520

SECTION 10800 - TOILET AND BATH ACCESSORIES

PART ONE - GENERAL

DESCRIPTION

Provide each type toilet and bath accessory shown on drawings and specified herein.

Provide wood blocking in stud walls behind all mounted fixtures.

RELATED WORK SPECIFIED ELSEWHERE

General & Supplementary Conditions, Special Requirements:
Wood Blocking: Section 06100

QUALITY ASSURANCE

Accessories: Products of a single manufacturer, where possible.

SUBMITTALS

Submit manufacturer's descriptive brochures and necessary supplemental detailed information indicating model numbers, quality of materials, location of items, sizes, finishes and anchorage required to install each item.

Maintenance data, operating instructions and keys required for each type of equipment and lock.

PRODUCT DELIVERY, STORAGE & HANDLING

Deliver items in manufacturer's original unopened protective packaging.

Store materials in original protective packaging to prevent soiling, physical damage or wetting.

Handle so as to prevent damage to finished surfaces.

Protection:

1. Maintain protective covers on all units until installation is complete.

2. Remove protective covers at final clean-up of installation.

GUARANTEE

Guarantee all mirrors for 10 years against silver spoilage.

PART TWO - PRODUCTS

MATERIALS

Mirror: Clear laminate float glass with wooden frame. Allowance $400 per mirror.

Toilet Tissue Dispenser: Models 5084 as manufactured by Bradley Corp. Approved equal manufacturer by Bobrick or ASI.

Grab Bars: Model 812 as manufactured by Bradley Corp. Approved equal as manufactured by Bobrick (B6106) or ASI (3800).

Paper Towel: Models 2A00 Diplomat Series as manufactured by Bradley Corp. B-or as manufactured by Bobrick or ASI approved equal.

Seat Cover Dispenser: Models 5A40 Diplomat Series as manufactured by Bradley Corp. B-or as manufactured by Bobrick or ASI approved equal.

Mop & Broom Holder: Model 9953 (3 Holders) as manufactured by Bradley Corp. (B223) Bobrick or ASI (8215).

Robe Hook: Model 9125 as manufactured by Bradley Corp. or B-672 as manufactured by Bobrick or ASI (7345). Provide @ all toilet stalls mounted to doors.

Surface Mount Door Bumper: Model 9144 as manufactured by Bradley Corp. or B-6877 as manufactured by Bobrick or ASI (0719). Provide @ all toilets.

PART THREE - EXECUTION

INSPECTION

Check openings provided to receive recessed units for correct dimensions, plumbness of blocking or frames, preparation that would affect installation of accessories.

Check areas to receive surface mounted units for conditions that would affect quality and execution of work.

Verify spacing of plumbing fixtures and toilet partitions that affect installation of accessories.

Do not begin installation of washroom accessories until openings and surfaces are acceptable.

INSTALLATION

Drill holes to correct size and application that is concealed by item, with 1/4 in. tolerance.

Mount recessed accessories into wall openings with wood screws through cabinet side into wood blocking, or sheet metal screws into metal frames. All fasteners to be non-ferrous.

Mount surface mounted accessories to back up with fasteners recommended by manufacturer. Exposed fasteners to be of same material and finish as accessory. Adhesive fasteners not acceptable.

ADJUST AND CLEAN

Adjust accessories for proper operation.

After completion of installation, clean and polish all exposed surfaces.

Deliver keys and instruction sheets to Owner.

SCHEDULE OF TOILET AND BATH ACCESSORIES

Use this schedule for all restrooms

Each single occupancy restrooms to have: (All fixtures shall be black)

(1) Mirror – Provide all every lavatory sink or sink drain.- 1 total
(1) Paper Towel Dispenser – 1 total
(1) 36" & 42" Grab bar @ side wall of each water closet (handicapped)
(1) Single Toilet Tissue Dispenser 1 total

Each Janitor sink to have:

(1) Mop holder @ each mop sink

END OF SECTION 10800

CITIZEN'S PROGRESSIVE BANK
5301 CYPRESS STREET
WEST MONROE, LA
GUTH PN: 2-7284

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SEALS

Specification Divisions/Sections prepared under my responsible supervision:
DIVISION 22 PLUMBING
DIVISION 23 HEATING, VENTILATION AND AIR CONDITIONING

STEVEN R. ROBERTSON, P.E.
MECHANICAL ENGINEER – LA LICENSE 21502
JOHN J. GUTH ASSOCIATES, INC.

Specification Divisions/Sections prepared under my responsible supervision:
DIVISION 26 ELECTRICAL
DIVISION 27 COMMUNICATION
DIVISION 28 ELECTRONIC SAFETY AND SECURITY

J. PATRICK FOREMAN, P.E.
ELECTRICAL ENGINEER– LA LICENSE 22378
JOHN J. GUTH ASSOCIATES, INC.

SECTION 22 05 00 - BASIC MECHANICAL MATERIALS AND METHODS FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems
   2. Dielectric fittings
   3. Escutcheons
   4. Equipment installation requirements common to equipment sections
   5. Painting and finishing
   6. Supports and anchorages

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and 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 in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete in every respect and ready for the intended use, as applicable in each instance.

I. "Inspect": The term "inspect" or "inspection: when used to describe observation of the Contractor's Work by the Engineer shall mean an endeavor to guard the Owner against defects and deficiencies in the Work and to determine, in general, if the Work is being performed in a manner such that, when completed, it will be in accordance with the Contract Documents.

J. Wiring: the term "wiring" shall include providing raceway, conductors, and cable in accordance with the requirements of Division 26.

K. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PVC: Polyvinyl chloride plastic.

L. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Escutcheons.

B. Shop Drawings: Detail fabrication and installation for metal supports and anchorage for mechanical materials and equipment.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Equipment Selection: Equipment of higher electrical characteristics, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are appropriately modified. The Contractor will be responsible for any added costs for such modifications. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

C. Drawings: The Mechanical drawings show the general arrangement of piping, equipment, and appurtenances, and shall be followed as closely as actual building construction and the work of other trades will permit. The Mechanical work shall conform to the requirements shown on all the drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Contractor shall investigate the structural and finish conditions and other building components affecting the work and shall arrange his work accordingly, providing such offsets, fittings, and accessories as may be required to meet such conditions. No extras will be approved for required additional offsets and fittings. Any offsets or additional fittings required to coordinate plumbing systems

with existing conditions and other trades, or that are necessary for the complete installation of the system, including modifications to shop or off-site fabricated piping and/or ductwork, all shall be provided by the Contractor at no additional cost to the Owner.

D. Codes and Standards: comply with the following codes. Comply with the latest edition except where indicated otherwise or a specific edition is required by the authority having jurisdiction:
   1. International Building Code
   2. International Mechanical Code
   3. Louisiana State Plumbing Code
   4. Louisiana State Energy Code
   5. Plumbing and Mechanical Codes
   6. NFPA 54, 70, 72, 90A, 90B, 96, and 101
   7. All applicable local codes

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.7 COORDINATION

A. Coordinate mechanical equipment installation with other building components and existing conditions.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Costs for all utility connections shall be the Contractor's responsibility, including any connections made by the utility company.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by firms regularly engaged in the manufacture of products required, whose products have been in satisfactory use in similar service.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 Piping Sections and "Pipe and Fitting Material Schedule" on the drawings for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 Piping Sections and "Pipe and Fitting Material Schedule" on the Drawings for special joining materials not listed below.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8, BAg1, silver alloy.

D. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
3. PVC to ABS Piping Transition: ASTM D 3138.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, flanged, solder-joint, plain, or weld-neck end connections that match piping system materials and isolate joined dissimilar metals to prevent galvanic action and stop corrosion.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated.

D. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Install components with pressure rating equal to or greater than system operating pressure.

C. Install piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install couplings according to manufacturer's written instructions.

G. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

H. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

I. Install all buried water piping, regardless of content, a minimum of 12 inches below and 12 inches laterally from any buried electrical line. Whether in conduit or direct buried cable, this requirement shall apply regardless of voltage of the electrical line.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

K. Install piping to permit valve servicing.

L. Install piping at indicated slopes.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Pulled-tee, extruded-tee, thread-o-let, weld-o-let, and mitered elbow connections are not acceptable, unless specifically indicated otherwise. Provide manufactured tee and elbow fittings.

P. Install tees with removable threaded cleanout plugs at each change in direction in all condensate drain piping.

Q. Select system components with pressure rating equal to or greater than system operating pressure.

R. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: Cast-brass type with chrome-plated finish, split-casing for existing piping, and one-piece for new piping.
    c. Insulated and Bare Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    d. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

S. Sleeves are not required for core-drilled holes.

T. Permanent sleeves are not required for holes formed by removable PE sleeves.

U. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating interior walls.
    c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to

extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 7 Section, "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. 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.

V. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials that are approved for the application and that preserve the intended fire/smoke rating of the separation being penetrated. Refer to Division 7 Section, "Through-Penetration Firestop Systems" for materials.

W. Verify final equipment locations before roughing-in.

X. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements, Division 22 Sections, and Schedules on the drawings, specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.

3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.
5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Dry Piping Systems: Install dielectric unions to connect piping materials of dissimilar metals.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Manufacturer's Installation and Operating Instructions: All equipment and material shall be installed and operated in strict accord with manufacturer's "Installation and Operating Instructions." The manufacturer's installation instructions shall become part of this specification, and shall take precedence over and/or supplement any specification herein and as shown and/or described on plans. All individual items of equipment and components thereof shall be 100 percent accessible for repair, removal, or replacement without functional impairment or dismantling of any adjoining major surfaces or assemblies.

B. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment to allow right of way for piping installed at required slope.

F. Cut and drill floors, roofs, walls, partitions, ceilings, and other surfaces as required to permit installation of mechanical piping, ducts, and equipment. Perform cutting by skilled mechanics of trades involved.

G. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

H. Electrical Work: Wherever equipment requiring electrical power connection is specified, all wiring shall be furnished and installed under Division 26 of the Specifications. Motor starters, starting switches, protective devices, and other means for the operation and control of equipment shall be furnished under the various Division 22 Sections, and installed and electrically connected complete under Division 26 unless otherwise specifically noted, except that control devices that are installed in or on ducts, piping, or mechanical equipment shall be mounted under Division 22. If equipment is furnished requiring power wiring different from that indicated on the electrical drawings, the Contractor furnishing the equipment shall be responsible for any required revisions and pay any additional costs connected therewith. Wiring revisions shall be submitted to the Architect for approval prior to installation.

1. Contractors furnishing items to be wired shall provide adequate wiring diagrams.

3.5 EARTHWORK

A. Refer to Division 2 Section, "Earthwork" for excavation, trenching and backfilling.

3.6 PAINTING

A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean bolted connections and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.7 MISCELLANEOUS

A. Services: Provide gas, water, sanitary sewer, and services as indicated.

B. The Contractor shall, before submitting a proposal, verify the location, depth, size, and pressure or grade of existing main gas, water and sewer lines to which he is to make connections for services to the building and shall include in his bid the cost of any required revisions. If for any reason conditions appear that will adversely affect the proper installation and operation of the systems, such conditions shall be reported to the Architect in writing for his decision ten days prior to bid date. All connection charges, cutting and patching of paving, etc. required for connection to utility lines, including those provided by the utility company, shall be paid for or provided by the Contractor. Make provisions for metering as indicated and as required by the serving utilities. Locations of plumbing lines and point of service entrance are shown in accordance with data provided by various departments of city and/or utility companies involved. The points of connection to the utility lines are approximate only and shall be verified by each bidder. Each bidder shall include adequate funds in his bid price to cover all

cost of connections to utility lines regardless of exact location, or those who make the connection, and shall hold the Owner harmless as to additional costs or extras regarding utility connections.

END OF SECTION 22 05 00

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes hangers and supports for plumbing system piping and equipment.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Trapeze support systems for piping shall be designed to support multiple pipes and capable of supporting combined weight of supported systems, system contents, and test water.

1.5 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Firms regularly engaged in manufacture of supports and hangers, of types and sizes required, whose products have been in satisfactory use in similar service.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. Nonmetallic Coatings: On hangers for electrolytic protection where hangers are in direct contact with copper tubing.

2.3 PIPE POSITIONING SYSTEMS

A. Description: IAPMOPS42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications

2.5 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in sections specifying equipment and systems.

B. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
2. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
3. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
4. U-Bolts (MSS Type 24): For securing pipe to trapeze hangers, NPS 1/2 to NPS 12.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

F. Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, selected by Installer to suit building substrate

conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Hanger Shield Inserts:

a. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
b. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.
c. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
d. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
3. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Install building attachments and attach to structure. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.

C. Install fasteners according to manufacturer's written instructions.

D. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

E. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

J. Do not use wire or perforated metal to support piping, and do not support piping from other piping, electrical conduit, ductwork, or equipment.

K. Insulated Piping: Comply with the following:

1. Install MSS SP-58, Type 40 protective shields on all insulated piping. Shields shall span arc of 180 degrees, except shields at trapeze hangers shall be full circumference.
2. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3: 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
b. NPS 4 to 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.

3.3 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for steel trapezes and equipment supports.

B. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.1 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands from welded-structural-steel shapes or manufactured metal framing systems to suspend equipment from structure overhead or to support equipment above floor.

B. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

C. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

D. Provide lateral bracing, to prevent swaying, for equipment supports.

3.2 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm)

3.3 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

B. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint.

END OF SECTION 22 05 29

SECTION 22 07 19 – PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Section 22 05 29 "Hangers and Supports for Plumbing Systems" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets, for each type of product indicated.

B. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section, 22 05 29 "Hangers and Supports for Plumbing Systems".

B. Coordinate clearance requirements with piping Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers regularly engaged in the manufacture of piping insulation products of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

    a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
    b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
5. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.3 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.

C. Wire: 0.080 inch (2.0 mm), nickel-copper alloy; 0.062 inch (1.6 mm), soft-annealed, stainless steel; or 0.062 inch (1.6 mm), soft-annealed, galvanized steel.

2.4 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments.
2. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
3. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

N. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3 inch- (75 mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

P. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body to thickness equal to adjoining pipe insulation. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

3.5 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.
3. Domestic water piping located in spaces in the interior of residential buildings or the residential areas of a building with mixed occupancy.

3.6 FIELD QUALITY CONTROL

A. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

B. Reinstall insulation and covers on fittings and valves if required to be uncovered for inspection according to these Specifications.

3.7 INSULATION APPLICATION SCHEDULE, GENERAL

A. Refer to insulation application schedules for required insulation materials and vapor retarders.

B. Application schedules identify piping system and indicate pipe size ranges and material thickness.

3.8 INTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for interior insulation inside both the commercial areas of mixed occupancy buildings and in wall spaces that have an exterior exposure for residential buildings or the residential portions of a mixed occupancy building.

B. Service: Domestic cold water.

1. Operating Temperature: 35 to 60 degrees F (2 to 15 degrees C).
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:

    a. Copper Pipe, 1 Inch and Smaller: 1/2 inch.
    b. Copper Pipe, 1-1/4 Inches and Larger: 1 inch.

4. Vapor Retarder Required: Yes.
5. Finish: None.

C. Service: Domestic hot water.

1. Operating Temperature: 60 to 140 degrees F (15 to 60 degrees C).
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following thicknesses:

    a. Runouts up to 2 Inches and less than 12 Foot length: 1/2 inch.
    b. 2 Inches size and less: 1 inch.

4. Vapor Retarder Required: No.
5. Finish: None.

D. Service: Exposed sanitary drains and domestic water supplies and stops for fixtures for the disabled, which are installed without an enclosed cabinet space below the fixture.

1. Insulate and jacket with factory insulation and white PVC jacket kit conforming to ADA and equivalent to Truebro "Handi Lav-Guard," McGuire Manufacturing Co. "ProWrap," or approved equivalent.
2. All seams shall be the manufacturer's standard, publicized method of joining, i.e. snap lock, Velcro, etc. Do not staple, use twist ties, or electrical nylon straps. Supplies and trap assembly shall present a neat, workmanlike, finished appearance.

END OF SECTION 22 07 19

SECTION 22 11 16 - DOMESTIC WATER PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Extent of domestic water piping systems work is indicated on Drawings and Schedules and by requirements of this Section.

B. Applications for domestic water piping systems include the following.
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.

1.3 Refer to Section 22 07 19 “Plumbing Piping Insulation” for insulation required in connection with domestic water piping; not work of this Section.

1.4 Trenching and backfill required in conjunction with exterior water piping is specified in applicable Division 2 Sections, and is included as work of this Section.

1.5 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.6 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 80 psig (550 kPa), unless otherwise indicated.

1.7 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of domestic water piping systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service.

B. Plumbing Code Compliance: Comply with applicable portions of governing Plumbing Code pertaining to plumbing materials, construction, and installation of products.

1. Piping materials shall bear label, stamp, or other markings of specified testing agency.
2. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
3. Retain paragraph below if all piping is for potable-water service.
4. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

1.8 SUBMITTALS

A. Product Data: Submit Manufacturer's data for domestic water piping systems, materials, and products.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING MATERIALS AND PRODUCTS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated and scheduled on the drawings. Where not indicated or scheduled, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in domestic water piping systems. Where more than one type of material or product is indicated, selection is Installer's option.

2.2 BASIC PIPE, TUBE, AND FITTINGS

A. General: Provide pipe, tube, and fittings complying with Section 22 05 00 “Basic Mechanical Materials and Methods for Plumbing Systems", in accordance with the Schedule on the Drawings.

2.3 BASIC HANGERS AND SUPPORTS

A. General: Provide hangers and supports complying with Section 22 05 29 “Hangers & Supports for Plumbing Systems".

2.4 BASIC VALVES

A. Ball Valves – 2 Inches (DN50) and Smaller: MSS SP-110, Class 150, 600 psi (4140 kPa) CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2 inch (DN15) valves and smaller and conventional port for 3/4 inch (DN20) valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded end connections. Where insulation is indicated or specified, provide extended stems to receive insulation and allow valve operation without damaging insulation.

1. Operator: Vinyl-covered steel lever handle.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equivalent.

    a. Milwaukee, BA100, NSF.
    b. Apollo, #70-100, 70-120-04.
    c. Hammond, #8501.
    d. Nibco, #585.

2.5 SPECIAL VALVES

A. General: Special valves required for domestic water piping systems include the following types:

1. Interior Hose Bibb: 3/4 inch angle sill faucet, polished chrome plated, fixed wheel handle, and with vacuum breaker.
2. Exterior Sillcocks: 3/4 inch size, non-freeze type with anti-siphon backflow preventer and brass casing:

    a. Wade: Model 8600.
    b. Zurn: Model Z-1321.

3. Exterior Sillcocks: For locations where wall thickness will not permit non-freeze sillcock and piping to be fully concealed, provide mild climate type with integral backflow preventer.

    a. Wade: Model 8600MT or HY-1
    b. Zurn: Model Z-1330.

B. TRAP SEAL PRIMER VALVES

1. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, automatically activated when a pressure drop of 5-10 psig is sensed. Valves operating range shall be 35 – 75 psig. Provide where flush valves do not include a trap primer fitting and a trap primer is required by code or is shown on Drawings.

    a. Manufacturers:
    b. Precision Plumbing Products, Inc.
    c. 125-psig (860-kPa) minimum working pressure.
    d. Bronze body with atmospheric-vented drain chamber.
    e. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
    f. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
    g. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

C. VACUUM BREAKERS

1. Pipe-Applied, Atmospheric-Type Vacuum Breakers.

    a. Standard: ASSE 1001.
    b. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
    c. Body: Bronze.

d. Inlet and Outlet Connections: Threaded.
e. Finish: Rough bronze.

D. DOUBLE-CHECK, BACKFLOW-PREVENTION ASSEMBLIES:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
4. Size: 2” and smaller.
5. Body: Bronze for NPS 2 (DN 50) and smaller.
6. End Connections: Threaded for NPS 2 (DN 50) and smaller.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:

a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.

E. DRAIN VALVES

1. Hose-End Drain Valves: MSS SP-110, NPS 3/4 (DN 20) ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

a. Inlet: Threaded or solder joint.
b. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap.

2.6 WATER HAMMER ARRESTERS

A. General: ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

1. Manufacturers:

a. Josam Co.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Wade
e. Zurn Industries, Inc.; Wilkins Div.

PART 3 - EXECUTION

3.1 INSTALLATION OF DOMESTIC WATER PIPING

A. General: Install water distribution piping in accordance with Section 22 05 00 “Basic Mechanical Materials and Methods for Plumbing Systems".

B. Drawings, plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordinate Drawings.

C. Install copper tubing under building slab according to CDA'S "Copper Tube Handbook."

D. Install domestic water piping level and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and coordinate with other services occupying that space.

H. Install piping adjacent to equipment and specialties to allow service and maintenance.

I. Install piping to permit valve servicing.

J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. 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:

D. Apply appropriate tape or thread compound to external pipe threads.

E. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

F. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

G. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

H. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 INSTALLATION OF PIPING SPECIALTIES

A. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated. Provide access to panels over valves concealed in wall.

B. Trap Seal Primer Valves: Install trap seal primer valves with outlet pitched down toward drain tap a minimum of 1 percent and connect to floor drain, trap or inlet fitting. Adjust valve for proper flow.

C. Install wood blocking reinforcement for wall mounting and recessed type plumbing specialties.

D. For public toilets and toilets in commercial or retail areas, install individual ball type shutoff valve in water supply to trap seal primer valve and install minimum 12 inch x 12 inch access panel over valve and trap primer.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with Section 22 05 29 “Hangers & Supports for Plumbing Systems".

3.5 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by governing Plumbing Code.

B. Rough-in and connect all equipment, including kitchen equipment, including any interconnecting piping. Provide stops at each item. Rough-in in accord with equipment suppliers rough-in drawings. Provide all water piping work required for equipment installation, adjust, and leave in operation according to manufacturer's recommendations.

3.6 FIELD QUALITY CONTROL

A. Test water and hot water piping throughout hydrostatically at 150 psig (four hours).

B. Repair or replace domestic water piping as required to eliminate leaks and retest as specified to demonstrate compliance.

C. Sterilization: Sterilize all water lines in strict accordance with State Board of Health requirements. After flushing out, obtain approval of water sample analysis from State Board of Health and submit to Architect.

END OF SECTION 22 11 16

SECTION 22 13 16 - SOIL, WASTE, AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of soil, waste, and vent piping system work is indicated on drawings and schedules, and by requirements of this Section.

B. Trenching and backfilling required in conjunction with underground drain piping is specified in applicable Division 2 Sections and is included as work of this Section.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of piping products of types, materials, and sizes required, whose products have been in satisfactory use in similar service.

B. Plumbing Code Compliance: Comply with applicable portions of governing Plumbing Code pertaining to plumbing materials, construction, and installation of products.

C. ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of soil, waste, and vent piping systems.

D. PDI Compliance: Comply with applicable Plumbing and Drainage Institute Standards pertaining to products and installation of soil, waste, and vent piping systems.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data for soil, waste, and vent piping systems materials and products.

PART 2 - PRODUCTS

2.1 SOIL, WASTE AND VENT PIPING MATERIALS AND PRODUCTS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types

matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil, waste, and vent piping systems. Where more than one type of materials or product is indicated, selection is Installer's option.

2.2 BASIC PIPE, TUBE AND FITTINGS

A. General: Provide pipe, tube, and fittings complying with Section 22 05 00 – "Basic Mechanical Materials and Methods for Plumbing Systems" in accordance with the schedule on the drawings.

2.3 BASIC HANGERS AND SUPPORTS

A. General: Provide hangers and supports complying with Section, 22 05 29 "Hangers & Supports for Plumbing Systems".

B. Provide Pipe Positioning systems for each fixture per 22 05 29.

2.4 DRAINAGE PIPING PRODUCTS

A. General: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.

B. Semi-Cast Trap Primer Tailpiece: 17 Gauge, tubular, chrome plated, brass tube with 5/8" OD compression branch connection for installation under Sink/Lavatory. Complies with ASME A112.18.2-2011/CSA B125.2-11. Equivalent to ProFlo PF127033/127044.

C. Cleanout Plugs: Cast-bronze or brass, threaded, countersunk head.

D. Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top as follows:

1. Nickel-Bronze Top: Manufacturers standard cast unit of the pattern indicated:

    a. Pattern: Exposed rim type, with recess to receive 1/8 inch thick resilient floor finish where applicable.
    b. Pattern: Exposed rim type, with recess to receive 1 inch thick terrazzo floor finish where applicable.
    c. Pattern: Exposed flush type, standard non-slip scored or abrasive finish.
    d. Carpet Marker: Include approximately 1-1/4 inches diameter carpet marker for cleanouts that occur in carpeted areas.

E. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover including screws.

F. Flashing: As approved by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION OF SOIL, WASTE AND VENT ABOVE GROUND PIPING

A. General: Install soil, waste, and vent piping in accordance with Section 22 05 00 – "Basic Mechanical Materials and Methods for Plumbing Systems" and with governing Plumbing Code.

B. Flashing: Flash all vent penetrations through roofs as approved by roof manufacturer. Offset vents where necessary to provide 2 feet – 0 inches minimum clearance from other flashing such as outside walls, curbs, etc. All flashing shall be as approved by roofing manufacturer.

3.2 INSTALLATION OF BUILDING DRAIN PIPING

A. General: Install underground building drains as indicated and in accordance with governing Plumbing Code. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag-in-line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

B. Install soil, waste and vent piping pitched to drain at minimum slope of 1/4 inch per foot (2 percent) for piping 3 inches and smaller, and 1/8 inch per foot (1 percent) for piping 4 inches and larger.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with Section 22 05 29 "Hangers & Supports for Plumbing Systems".

3.4 INSTALLATION OF DRAINAGE PIPING PRODUCTS

A. Cleanouts: Install in sanitary aboveground piping and sanitary building drain piping as indicated, as required by governing Plumbing Code; and at each change in direction of piping greater than 45 deg; at minimum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish. Cleanouts shall be same size as pipe up to 4 inches and not less than 4 inches for larger pipe. All cleanouts shall be accessible. All cleanouts shall be opened, cleaned, and greased after all concrete work is completed.

B. Outside cleanouts shall be brought up flush with finish grade or paving. Where at grade, they shall be set in 14 inches x 14 inches x 5 inches concrete pads.

C. Inside cleanouts shall be brought up flush with floors and provided with cleanout covers or in wall with wall cleanout cover.

D. Semi-cast trap primer tailpiece shall be installed below lavatories/sinks, as shown or noted to replenish water seal in p-traps. Extend ½" type 'K' copper drain pipe down in wall and under floor, sloped to drain. Provide escutcheon at wall penetration.

3.5 EQUIPMENT CONNECTIONS

A. Piping Runouts to Fixtures: Provide soil and waste piping runouts to equipment, plumbing fixtures, and drains with approved trap of sizes indicated; but in no case smaller than required by governing Plumbing Code. Comply with equipment manufacturer's instructions where not indicated otherwise.

B. Rough-in and connect all kitchen equipment, including any interconnecting piping. Provide waste piping to drains and any required traps or fittings. Rough-in in accord with equipment suppliers rough-in drawings. Provide all waste and vent piping work required for equipment installation, adjust, and leave in operation according to manufacturer's recommendation.

3.6 PIPING TESTS

A. Test soil, waste, and vent piping system in accordance with requirements of governing Plumbing Code, but not less than 10 foot head water test.

END OF SECTION 22 13 16

SECTION 22 33 00 - ELECTRIC, DOMESTIC WATER HEATERS (LIGHT COMMERCIAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following for domestic water systems:

1. Light commercial, electric water heaters (“Lo-Boy”).
2. Compression Tanks.
3. Accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

B. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

A. Delete this Article unless special warranty for heating elements, storage tank, or other component is required. Household and small commercial water heaters cannot usually justify added cost of special warranties.

B. When warranties are required, verify with Owner's counsel that special warranties stated in this Article are not less than remedies available to Owner under prevailing local laws. Coordinate with Division 1 Section "Warranties."

C. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in

addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

D. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include storage tanks.
2. Warranty Period: From date of Substantial Completion:

a. Storage Tanks: 10 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Residential, Storage, Electric Water Heaters:

a. A.O. Smith:
1) Model DEL (Lo Boy).
2) Model DEN (Standard).
b. Rheem Manufacturing Co.; Ruud Water Heater Div.:
1) Model ELDS (Lo Boy).
2) Model ELD (Standard).
c. State Industries:
1) Model CPE-20MSA (Lo Boy).
2) Model CPE-20RTA (Standard).

2. Drain Pan Units:
a. Safety: W. H. Safety Products, Inc.

3. Water Heater Platform:
a. Holdrite Quick Stand #50-swhp.

4. Expansion Tank:
a. State Waterguard, IAPMO approved for potable water.

5. Temperature & Pressure Relief Valves:
a. Watts Series 335

2.2 LIGHT-COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS

A. Description: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.

B. Storage Tank Construction: ASME-code steel with 150-psig (1035-kPa) working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, pressure gage, thermometer, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
2. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
3. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
4. Jacket: Steel, with enameled finish.

C. Heating Elements: Two electric, screw-in, immersion type.

1. Temperature Control: Adjustable thermostat with wiring arrangement for non-simultaneous operation.
2. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

D. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.

E. Anode Rod: Factory installed, magnesium.

F. Dip Tube: Factory installed. Not required if cold-water inlet is near bottom of storage tank.

G. Special Requirement: NSF 5 construction.

2.3 COMPRESSION TANKS

A. Retain this Article only if small, non-ASME-code, diaphragm tanks with a capacity of 25 gal. (95 L) or less are required. Small tanks are usually available with 150-psig (1035-kPa) working-pressure rating. Large tanks are usually available with 100-psig (690-kPa) working-pressure rating. A multiple, small-tank arrangement may be used to match system pressure and volume requirements. Other compression tanks are specified in Division 15 Section "Potable-Water Storage Tanks."

B. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

2. If more than one compression tank is required on Project, delete subparagraph and associated subparagraphs below and schedule tanks on Drawings.
3. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig (1035 kPa).
b. Capacity Acceptable: As indicated on the drawings.

2.4 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

B. Vacuum Relief Valves: Comply with ASME PTC 25.3. Furnish for installation in piping.

1. Exception: Omit if water heater has integral vacuum-relieving device.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN20).

D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

E. Water Heater Mounting Brackets: Pre-fabricated steel bracket for wall mounting and capable of supporting water heater and water or 600 lbs, whichever is greater. Provide brackets where indicated on the Drawings.

F. Drain Plans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain or into open drain as directed.

C. Install vacuum relief valves in cold-water-inlet piping.

D. Install water heater drain piping as indirect waste to spill into open drains or over floor drains.

E. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

F. Install expansion tank.

G. Fill water heaters with water.

H. Charge expansion tank with air.

3.2 CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to water heater to allow service and maintenance.

D. Connect hot- and cold-water piping with shutoff valves and unions.

E. Make connections with dielectric fittings where piping is made of dissimilar metal.

F. Electrical Connections: Power wiring and disconnect switches are specified in Division 16 Sections. Arrange wiring to allow unit service.

G. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. In addition to manufacturer's written installation and startup checks, perform the following:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Test operation of safety controls, relief valves, and devices.
6. Energize electric circuits.
7. Adjust operating controls.
8. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F (60 deg C) unless piping system application requires higher temperature.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

1. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout" or "Operation and Maintenance Data."

END OF SECTION 22 33 00

SECTION 22 42 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of plumbing fixtures and trim work is indicated by drawings and schedules, and by requirements of this Section.

B. Types of plumbing fixtures required for the project are indicated by the drawings and schedules.

C. Refer to Division 22 Sections for domestic water piping systems used in conjunction with plumbing fixtures; not work of this Section.

D. Refer to Division 22 Sections for soil and waste piping systems used in conjunction with plumbing fixtures; not work of this Section.

E. Refer to Division 26 Sections for electrical connections to water coolers and other plumbing fixtures; not work of this Section.

1.3 DEFINITIONS

A. Definitions in this Article are terms from standards, references, and model plumbing codes. See Evaluations for a comprehensive list of definitions.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 QUALITY ASSURANCE

A. Manufacturers: Provide products by one of the manufacturers listed in the schedule on the drawings or approved equivalent.

B. Plumbing Fixture Standards: Comply with applicable portions of governing Plumbing Code pertaining to materials and installation of plumbing fixtures.

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. Regulatory Requirements: Comply with requirements of CABO A117.1, "Accessible and Usable Buildings and Facilities;" Public Law 90-480, "Architectural Barriers Act;" and Public Law 101-336, "Americans with Disabilities Act;" regarding plumbing fixtures for physically handicapped people.

E. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

F. UL Labels: Provide water coolers which have been listed and labeled by Underwriters Laboratories.

G. ARI Labels: Provide water coolers which are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute standards.

H. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" and Public Law 101-336, "Americans with Disabilities Act" about plumbing fixtures for people with disabilities.

I. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

J. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

K. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

L. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

M. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Vitreous-China Fixtures: ASME A112.19.2M.

N. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Faucets: ASME A112.18.1M.
2. Hose-Connection Vacuum Breakers: ASSE 1011.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
5. NSF Materials: NSF 61.
6. Pipe Threads: ASME B1.20.1.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished, roughing-in dimensioned drawings, templates for cutting substrates, fixture carriers, and installation instructions.

B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in maintenance manual.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.

B. Handle plumbing fixtures carefully to prevent breakage, chipping, and scoring the fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

1.7 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified and as scheduled on the Drawings.

2.2 PLUMBING FIXTURES

A. General: Provide factory-fabricated fixtures of type, style, and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Provide low consumption type where so scheduled or where required by Code. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

1. Vacuum Breakers: Provide with flush valves and elsewhere where required by governing regulations, including locations where water outlets are equipped for hose attachment.

B. P-Traps: Include removable P-traps where drains are indicated for direct connection to drainage system.

C. Carriers: Provide cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron as indicated.

D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations and within cabinets, provide chrome plated cast-brass escutcheons with set screw.

F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction.

G. Comply with additional fixture requirements contained in fixture schedule on drawings.

H. Floor Drains: Provide drains equivalent to that scheduled on drawings. Provide minimum top size of 5 inches for 2 inches size, 6 inches for 3 inches size, and 10 inches for 4 inches size. Include clamping ring for drains in waterproofed membrane floors. Provide drains with water passage size not smaller than outlet size.

I. Trap Primer Tail Piece: Refer to “Section 22 13 16 Soil, Waste, & Vent Piping System".

2.4 MATERIALS

A. General: Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

B. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.

C. Stainless Steel Sheets: Type 302/304, hardest workable temper.
1. Finishes: No. 4, bright, directional polish on exposed surfaces.

D. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes, and specks; glaze exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.

C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

D. Install wall-hanging fixtures with tubular waste piping attached to supports.

E. Install counter-mounting fixtures in and attached to casework.

F. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
   1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture.

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install flushometer valves for accessible urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install toilet seats on water closets.

L. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

M. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

N. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install traps on fixture outlets.

   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

P. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

Q. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

R. Provide deep seal p-traps for all floor drains.

3.3 CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Connect water supplies from water distribution piping to fixtures.

D. Connect drain piping from fixtures to drainage piping.

E. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

F. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

G. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Revise this Article as required if Owner-furnished fixtures or fixtures specified in other Sections are included in this Project.

B. Verify that installed fixtures are categories and types specified for locations where installed.

C. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

D. Inspect installed fixtures for damage. Replace damaged fixtures and components.

E. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. In paragraph below, delete appliances not included in this Section.

C. Operate and adjust controls. Replace damaged and malfunctioning controls.

D. Delete fixture types in first paragraph below not in Project.

E. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

F. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 00

SECTION 23 05 00 - BASIC MECHANICAL MATERIALS AND METHODS – HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems
2. Dielectric fittings
3. Flexible connectors
4. Sleeves
5. Escutcheons
6. Grout
7. Equipment installation requirements common to equipment sections
8. Painting and finishing
9. Concrete bases
10. Supports and anchorages
11. Motor starters

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and 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 in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete in every respect and ready for the intended use, as applicable in each instance.

I. "Inspect": The term "inspect" or "inspection: when used to describe observation of the Contractor's Work by the Engineer shall mean an endeavor to guard the Owner against defects and deficiencies in the Work and to determine, in general, if the Work is being performed in a manner such that, when completed, it will be in accordance with the Contract Documents.

J. Wiring: the term "wiring" shall include providing raceway, conductors, and cable in accordance with the requirements of Division 16.

K. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PVC: Polyvinyl chloride plastic.

L. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Escutcheons.

B. Shop Drawings: Detail fabrication and installation for metal supports and anchorage for mechanical materials and equipment.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Equipment Selection: Equipment of higher electrical characteristics, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are appropriately modified. The Contractor will be responsible for any added costs for such modifications. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

C. Drawings: The Mechanical drawings show the general arrangement of piping, equipment, and appurtenances, and shall be followed as closely as actual building construction and the work of other trades will permit. The Mechanical work shall conform to the requirements shown on all

the drawings. Because of the small scale of the mechanical drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Contractor shall investigate the structural and finish conditions and other building components affecting the work and shall arrange his work accordingly, providing such offsets, fittings, and accessories as may be required to meet such conditions. No extras will be approved for required additional offsets and fittings. Any offsets or additional fittings required to coordinate mechanical systems with existing conditions and other trades, or that are necessary for the complete installation of the system, including modifications to shop or off-site fabricated piping and/or ductwork, all shall be provided by the Contractor at no additional cost to the Owner.

D. Codes and Standards: comply with the following codes. Comply with the latest edition except where indicated otherwise or a specific edition is required by the authority having jurisdiction:

1. International Building Code
2. International Mechanical Code
3. Louisiana State Plumbing Code
4. Louisiana State Energy Code
5. Ruston Plumbing and Mechanical Codes
6. NFPA 54, 70, 72, 90A, 90B, 96, and 101
7. All applicable local codes

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect fittings and piping specialties from moisture and dirt.

1.7 COORDINATION

A. Coordinate mechanical equipment installation with other building components and existing conditions.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and

controlling agencies. Costs for all utility connections shall be the Contractor's responsibility, including any connections made by the utility company.

F. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and other concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by firms regularly engaged in the manufacture of products required, whose products have been in satisfactory use in similar service.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 Piping Sections and "Pipe and Fitting Material Schedule" on the drawings for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 Piping Sections and "Pipe and Fitting Material Schedule" on the Drawings for special joining materials not listed below.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8, BAg1, silver alloy.

D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, flanged, solder-joint, plain, or weld-neck end connections that match piping system materials and isolate joined dissimilar metals to prevent galvanic action and stop corrosion.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.

2.7 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 (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.8 MOTOR STARTERS

A. Square D TeSys D-Line, General Electric CR300-Line, or approved equivalent (except where reduced voltage type are specified) with overload protection in each phase (with correctly sized heaters) in NEMA Type I enclosure unless noted otherwise, reset button in cover, and all of the same manufacturer. Provide auxiliary contacts for interlocking where required. Coordinate auxiliary contact needs with Section Building, Management, and Control Systems. Include HOA switch and pilot light in cover. Provide control power step-down transformer with sufficient additional capacity to handle essential control requirements (coordinate with Section Building, Management, and Control Systems).

2.9 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment. Manufacturer's nameplate is acceptable if all data is included.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: Accessible and visible location.

C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.

D. Plastic Equipment Markers: Black, laminated plastic.

1. Nomenclature: Include the following, matching terminology on schedules as closely as possible:

a. Name and plan number (AHU No. 1, Fan No. 1, etc.).

2. Size: Approximate 2-1/2 by 4 inches (65 by 100 mm).

E. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "AHU No. 1," or "Standpipe F12."

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Install components with pressure rating equal to or greater than system operating pressure.

C. Install piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. Install couplings according to manufacturer's written instructions.

G. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction

loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

H. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

I. Install all buried water piping, regardless of content, a minimum of 12 inches below and 12 inches laterally from any buried electrical line. Whether in conduit or direct buried cable, this requirement shall apply regardless of voltage of the electrical line.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

K. Install piping to permit valve servicing.

L. Install piping at indicated slopes.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Pulled-tee, extruded-tee, thread-o-let, weld-o-let, and mitered elbow connections are not acceptable, unless specifically indicated otherwise. Provide manufactured tee and elbow fittings.

P. Install tees with removable threaded cleanout plugs at each change in direction in all condensate drain piping.

Q. Select system components with pressure rating equal to or greater than system operating pressure.

R. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: Cast-brass type with chrome-plated finish, split-casing for existing piping, and one-piece for new piping.
c. Insulated and Bare Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
d. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

S. Sleeves are not required for core-drilled holes.

T. Permanent sleeves are not required for holes formed by removable PE sleeves.

U. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating interior walls.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 7 Section, "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. 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.

V. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials that are approved for the application and that preserve the intended fire/smoke rating of the separation being penetrated. Refer to Division 7 Section, "Through-Penetration Firestop Systems" for materials.

W. Verify final equipment locations before roughing-in.

X. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements, Division 15 Sections, and Schedules on the drawings, specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Dry Piping Systems: Install dielectric unions to connect piping materials of dissimilar metals.
3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Manufacturer's Installation and Operating Instructions: All equipment and material shall be installed and operated in strict accord with manufacturer's "Installation and Operating Instructions." The manufacturer's installation instructions shall become part of this specification, and shall take precedence over and/or supplement any specification herein and as shown and/or described on plans. All individual items of equipment and components thereof shall be 100 percent accessible for repair, removal, or replacement without functional impairment or dismantling of any adjoining major surfaces or assemblies.

B. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment to allow right of way for piping installed at required slope.

F. Cut and drill floors, roofs, walls, partitions, ceilings, and other surfaces as required to permit installation of mechanical piping, ducts, and equipment. Perform cutting by skilled mechanics of trades involved.

G. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

H. Electrical Work: Wherever equipment requiring electrical power connection is specified, all wiring shall be furnished and installed under Division 26 of the Specifications. Motor starters, starting switches, protective devices, and other means for the operation and control of equipment shall be furnished under the various Division 23 Sections, and installed and electrically connected complete under Division 26 unless otherwise specifically noted, except that control devices that are installed in or on ducts, piping, or mechanical equipment shall be mounted under Division 23. If equipment is furnished requiring power wiring different from that indicated on the electrical drawings, the Contractor furnishing the equipment shall be responsible for any required revisions and pay any additional costs connected therewith. Wiring revisions shall be submitted to the Architect for approval prior to installation.

1. Motor starters shall be provided for each poly phase motor and for single phase motors requiring automatic control. See motor control center schedule on electrical drawings for starters that will be provided under Division 26. Additional disconnects required by the National Electrical Code shall be furnished, installed, and connected under Division 26 of the Specifications.
2. Contractors furnishing items to be wired shall provide adequate wiring diagrams.
3. Temperature control wiring shall be furnished and installed in raceway under Division 23 according to the requirements of Division 26, specifically Section 26 05 19, "Conductors and Cables," and Section 26 05 33, "Raceways and Boxes."

3.5 EARTHWORK

A. Refer to Division 2 Section, "Earthwork" for excavation, trenching and backfilling.

3.6 PAINTING

A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.

2. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.10 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 23 05 00

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Trapeze support systems for piping shall be designed to support multiple pipes and capable of supporting combined weight of supported systems, system contents, and test water.

1.5 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Firms regularly engaged in manufacture of supports and hangers, of types and sizes required, whose products have been in satisfactory use in similar service.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. Nonmetallic Coatings: On hangers for electrolytic protection where hangers are in direct contact with copper tubing.

2.3 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
2. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
3. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
4. U-Bolts (MSS Type 24): For securing pipe to trapeze hangers, NPS 1/2 to NPS 12.

D. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

E. Building Attachments: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

F. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Hanger Shield Inserts:

    a. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
    b. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
3. Where trapeze hangers are used, secure piping with Type 24 U-bolts, and provide full circumference shields.

C. Install building attachments and attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping.

D. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

I. Do not use wire or perforated metal to support piping, and do not support piping from other piping, electrical conduit, ductwork, or equipment.

J. Support vertical piping at each floor and roof.

K. Insulated Piping: Comply with the following:

1. Install MSS SP-58, Type 40 protective shields on all insulated piping. Shields shall span arc of 180 degrees, except shields at trapeze hangers shall be full circumference.
2. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3: 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.

3.3 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for steel trapezes and equipment supports.

B. Fit exposed connections together to form even joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.5 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint.

END OF SECTION 23 05 29

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. The extent of test-adjust-balance (TAB) work is indicated by the requirements of this Section, and also by Drawings and Schedules, and is defined to include, but is not necessarily limited to, air distribution systems, and associated equipment and apparatus of HVAC work. The work consists of setting speed and volume (flow) adjusting facilities provided for the systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the work as required by the Contract Documents.

B. The component types of testing, adjusting and balancing specified in this Section includes the following as applied to HVAC equipment:

1. Split system heat pump units
2. Fans
3. Ductwork systems
4. Grilles, registers, and diffusers
5. Temperature controls

1.3 QUALITY ASSURANCE

A. Installer: A TAB firm with at least 3 years of successful test-adjust-balance experience on projects with testing and balancing requirements similar to those required for this project who is not the Installer of system to be tested and is otherwise independent of the project.

B. NEBB Compliance (Option): Comply with NEBB's "Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems" as applicable to HVAC air distribution systems and associated equipment and apparatus.

C. AABC Compliance (Option): Comply with AABC's Pub. No. 12173, "National Standards for Field Measurements and Instrumentation, Total System Balanced", as applicable to HVAC air and hydronic distribution system and associated equipment and apparatus.

D. Industry Standards: Comply with ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) recommendations pertaining to measurements, instruments and testing, adjusting, and balancing, except as otherwise indicated.

1.4 SUBMITTALS

A. Submit certified test report signed by the Test and Balance Supervisor who performed the TAB work.

B. Include identification and types of instruments used and their most recent calibration date with submission of final test report.

1.5 JOB CONDITIONS

A. Do not proceed with testing, adjusting, and balancing work until the work to be TAB'ed has been completed and is operable. Ensure that there is no latent residual work still to be completed.

B. Do not proceed until the work scheduled for TAB'ing is clean and free from debris, dirt, and discarded building materials.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housing which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.

B. At Tester's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housings.

2.2 TEST INSTRUMENTS

A. Utilize test instruments and equipment for the TAB work required, of the type, precision, and capacity as recommended in the following TAB standards:

1. NEBB's Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems.
2. AABC's National Standards for Field Measurements and Instrumentation, Total Balance System.

PART 3 - EXECUTION

3.1 GENERAL

A. Tester must examine the installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Notify the Contractor in writing of conditions detrimental to the proper completion of the test-adjust-balance work.

B. Do not proceed with the TAB work until unsatisfactory conditions have been corrected in a manner acceptable to the Tester.

C. Test, adjust and balance the environmental systems and components, as indicated, in accordance with the procedures outlined in applicable standards. In addition perform the following:

1. Test all safety devices for proper operation.
2. Adjust gas burners and gas inputs per Manufacturer's recommendations.
3. Calibrate temperature control systems and adjust heat anticipators per Manufacturer's recommendations.
4. Test smoke detector as recommended by Manufacturer.

D. Test, adjust and balance system during the summer for air conditioning systems and during winter for heating systems, including at least a period of operation at outside conditions within 5ºF wet bulb temperature of maximum summer design condition, and within 10ºF dry bulb temperature of minimum winter design condition. When seasonal operation does not permit measuring the final temperatures then take the final temperature readings when the seasonal operation does permit.

E. Prepare report of test results, including instrumentation calibration reports, in format recommended by the applicable standards. In addition certify that safety devices have been checked and are operating properly, that temperature control systems have been calibrated and are operating properly, that smoke detector is operating properly, and that heat anticipators have been adjusted in accord with manufacturer's recommendations.

F. Patch holes in insulation, ductwork, and housings, which have been cut or drilled for test purposes, in a manner recommended by the original Installer.

G. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

H. Prepare a report of recommendations for correcting unsatisfactory HVAC performances when system cannot be successfully balanced.

I. Retest, adjust, and balance system subsequent to significant system modifications or if report is unsatisfactory, and resubmit test results. Repeat until satisfactory results are obtained.

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes semirigid and flexible duct, plenum insulation, insulating cements, field-applied jackets, accessories, attachments, and sealing compounds.

B. Related Sections include the following:

1. Division 23 Section 23 07 19, "Pipe Insulation," for insulation for piping systems.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less and smoke-developed rating of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with Duct Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: firms regularly engaged in the manufacture of piping insulation products, of types and sizes required, whose products have been in satisfactory use in similar service.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin, rigid type, minimum 6 pound density, 0.23 maximum k factor at 75 deg F mean temperature, and with all-service jacket manufactured from Kraft paper, reinforcing scrim, aluminum foil, and vinyl film. Increase density at supports as required to limit deformation to 10 percent.

B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin, 3/4 pound density, 0.3 maximum k factor at 75 deg F mean temperature, and with all-service jacket manufactured from Kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.3 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).

1. Tape Width: 4 inches (100 mm).

B. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

C. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.4 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions, with smooth, straight, and even surfaces, and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments. Trapeze hangers shall be external of insulation.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

P. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

Q. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with anchor pins and speed washers.

1. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way maximum, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over compress insulation during installation.

2. Impale insulation over anchors and attach speed washers.
3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.
6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
8. Provide a 6 inches wide continuous strip of rigid insulation (density as required to limit deformation to 10 percent) at trapeze hangers. Locate between duct and blanket insulation.
9. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Space anchor pins as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
    c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.6 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply-, outside-, and return-air ductwork.
2. Indoor exposed supply-, outside-, and return-air ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Metal ducts with duct liner.
2. Flexible connectors.
3. Nameplates and data plates.
4. Access panels and doors in air-distribution systems.

E. Internal duct insulation is not acceptable.

3.7 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Supply-, outside-, and return-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

B. Service: Supply-, outside-, and return-air ducts and plenums, exposed.

1. Material: Mineral-fiber board.
2. Thickness: 1 inch (25 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Glass cloth.
5. Vapor Retarder Required: Yes.

END OF SECTION 23 07 13

SECTION 23 07 19 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 23 Section, "Duct Insulation" for insulation for ducts and plenums.
2. Division 23 Section, "Hangers and Supports for HVAC Systems" for pipe insulation shields.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets, for each type of product indicated.

B. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section, "Hangers and Supports for HVAC Systems".

B. Coordinate clearance requirements with piping Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers regularly engaged in the manufacture of piping insulation products of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

2.2 INSULATION MATERIALS

A. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

2.3 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Seal joints and seams with vapor-retarder mastic or adhesive.

G. Keep insulation materials dry during application and finishing.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

K. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

L. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

M. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

3.4 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.5 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.

3.6 FIELD QUALITY CONTROL

A. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

B. Reinstall insulation and covers on fittings and valves if required to be uncovered for inspection according to these Specifications.

3.7 INSULATION APPLICATION SCHEDULE, GENERAL

A. Refer to insulation application schedules for required insulation materials.

B. Application schedules identify piping system and indicate pipe size ranges and material thickness.

3.8 INTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for interior insulation inside both the commercial areas of mixed occupancy buildings and in wall spaces that have an exterior exposure for residential buildings or the residential portions of a mixed occupancy building.

B. Service: Condensate drain piping.

1. Operating Temperature: 35 to 75 degrees F (2 to 24 degrees C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 3/4 inch.
4. Field-Applied Jacket below 8’-0” where exposed, including equipment rooms: PVC Jacket.
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Refrigerant suction and vapor piping.

1. Operating Temperature: 35 to 75 degrees F (2 to 24 degrees C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 3/4 inch.
4. Field-Applied Jacket below 8’-0” where exposed, including equipment rooms: PVC Jacket.
5. Vapor Retarder Required: Yes.
6. Finish: None.

3.9 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building.

B. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 degrees F (2 to 10 degrees C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 3/4 inch.
4. Field-Applied Jacket: PVC Jacket.
5. Finish: Painted with two coats of ultraviolet-protective coating.
6. Finish: None.

END OF SECTION 23 07 19

SECTION 23 24 00 - CONDENSATE DRAIN PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes piping for drain lines and condensate drain piping.

B. Related Sections include the following:

1. Division 23 Section, "Basic Mechanical Materials and Methods" for general piping materials and installation requirements.
2. Division 23 Section, "Hangers and Supports" for pipe supports, product descriptions, and installation requirements. Hanger and support spacing is specified in this Section.

1.3 COORDINATION

A. Coordinate layout and installation of drain piping and suspension system components with other construction.

B. Coordinate piping installation with equipment supports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. General: Refer to Piping and Fitting Material Schedule on the drawings for applications of pipe and fitting materials.

B. Condensate piping must be hard drawn copper tubing as scheduled on the drawings.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

A. Refer to Division 23 Section, "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Install drains, consisting of a tee fitting, threaded nipple with threaded cap for system cleanout. Provide cleanout at each change in direction and at connection to unit.

C. Install piping at a uniform grade of 0.2 percent downward in direction of flow.

D. Increase/reduce pipe sizes using eccentric reducer fitting installed with level side down.

E. Unless otherwise indicated, install branch connections to mains using tee fittings in main pipe.

3.2 HANGERS AND SUPPORTS

A. Supports are specified in Division 23 Section, "Hangers and Supports" and notes on the drawings.

3.3 CONSTRUCTION

A. Refer to Division 23 Section, "Basic Mechanical Materials and Methods" and schedule on the drawings for joint construction requirements for soldered and brazed joints in copper tubing.

3.4 TERMINAL EQUIPMENT CONNECTIONS

A. Size for piping connections shall be same as for equipment connections. Increase pipe size at connection as indicated on drawings.

3.5 CLEANING

A. Flush drain piping systems with clean water.

END OF SECTION 23 24 00

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2 to plus-10 inch wg (minus 500 to plus 2500 Pa). Metal ducts include the following:

1. Rectangular ducts and fittings.
2. Round spiral-seam ducts and formed fittings.

B. Related Sections include the following:

1. Division 23 Section 23 33 00, "Ductwork Accessories," for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Engineer. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," for hangers and supports and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Codes and Standards:

1. SMACNA Standards: "HVAC Duct Construction Standards, Metal and Flexible."
2. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
3. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
4. International Mechanical Code: 2012 Edition.
5. International Building Code: 2012 Edition.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 (Z180) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4 inch (6 mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8 inch (10 mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.

C. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, use O.

D. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.3 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.

2.4 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Duct Size: Maximum 30 inches (750 mm) wide and up to 2 inch wg (500 Pa) pressure class.
2. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of non-braced panel area unless ducts are lined.

2.5 ROUND DUCT AND FITTING FABRICATION

A. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," or use prefabricated duct manufactured by one of the following:

1. Manufacturers:

a. McGill AirFlow Corporation.
b. SEMCO Incorporated.

B. Duct Joints:

1. Ducts up to 20 Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

C. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

D. Fabricate elbows using die-formed construction. Bend radius of die-formed shall be 1-1/2 times duct diameter.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts: Low pressure, 2 inch wg (500 Pa).
2. Return Ducts (Negative Pressure): 1 inch wg (250 Pa).
3. Exhaust Ducts (Negative Pressure): 2 inch wg (500 Pa).

B. All ducts shall be galvanized steel except ducts exposed in finished spaces shall be paint grip galvanized.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round and flat-oval ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Section 23 33 00, "Ductwork Accessories."

O. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction".

3.3 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

B. Seal and test ducts before external insulation is applied.

C. Test ducts in accordance with SMACNA. Make necessary repairs to sustain test pressure with not more than 5 percent leakage.

3.4 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet (5 meters) and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Section 23 33 00, "Ductwork Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards-Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

END OF SECTION 23 31 13

SECTION 23 33 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of ductwork accessories work is indicated on drawings and in schedules and by requirements of this section.

B. Types of ductwork accessories required for project include the following:

1. Low pressure manual dampers.
2. Turning vanes.
3. Duct hardware.
4. Duct access doors.
5. Flexible connections.

C. Refer to other Division 23 Sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible."
2. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems" pertaining to installation of ductwork accessories.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction and installation instructions.

B. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data and product data in maintenance manual; in accordance with requirements of Division 1 and Division 23 Section 23 05 00, "Basic Mechanical Materials and Methods."

PART 2 - PRODUCTS

2.1 DAMPERS

A. Low Pressure Manual Dampers: Provide manual volume dampers constructed of galvanized steel.

1. Square and Rectangular Dampers: Dampers shall have minimum 16 gauge frames and minimum 16 gauge roll formed blades. Multi-blade dampers shall have interlocking corrugated edges. Damper linkage shall be concealed in the damper frame. Dampers for ducts smaller than 10 inches by 10 inches may be single blade dampers, all other dampers shall have multiple blades. Provide opposed blade type unless indicated otherwise.
2. Round Dampers: Dampers shall be minimum 20 gauge frame and 20 gauge blade. Blade shall be secured to 3/8" square or 1/2" diameter galvanized or plated axle/shaft that extends beyond frame through bearings and locking hand quadrant.
3. Dampers shall include permanently lubricated oilite bronze bearings pressed securely into damper frame.
4. Dampers shall include factory furnished locking quadrants with 2" elevated dial and "OPEN" and "CLOSED" indicators.

B. Manufacturer: Subject to compliance with requirements, provide balancing dampers of one of the following or approved equivalent:

		Single Blade	Opposed Blade	Parallel Blade	Round Blade
1.	Ruskin	MD35	MD35	MD35	MDRS25
2.	Air Balance, Inc.	AC-1	AC-2	AC-1	AC-530
3.	Greenheck	MBD-15	MBD-15	MBD-15	
4.	American Warming and Ventilating	VC-1	VC-2	VC-2	VC-25
5.	Safe-Air	612	610	611	BDR

2.2 TURNING VANES

A. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

2.3 DUCT HARDWARE

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Test Holes: Provide in ductwork at fan inlet and outlet and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
2. Quadrant Locks: Provide quadrant lock device on one end of shaft and end bearing plate on other end for damper lengths over 12". Provide 2" extended quadrant locks and 2" end extended bearing plates for externally insulated ductwork.

a. Duro-dyne, Model 8021.

b. Young, Model 443B/404B.

3. Concealed dampers that are not accessible shall be controlled by a concealed regulator, type as indicated. Where type is not indicated, provide type as recommended by manufacturer for application. Include flush chrome plated access panel for each.

a. Duro-dyne, Model 8009.
b. Young, Model 301/315.

2.4 FLEXIBLE CONNECTIONS

A. Provide flexible duct connections wherever ductwork connects to HVAC equipment, fans or other vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.5 FLEXIBLE DUCTS

A. Manufacturers:

1. Flexmaster U.S.A., Inc.
2. Hart & Cooley, Inc.
3. McGill AirFlow Corporation.
4. Thermaflex.

B. Insulated-Duct Connectors: UL 181, Class 1, liner of multiple layers of aluminum laminate supported by helically wound, galvanized or coated spring-steel wire; fibrous-glass insulation; aluminized vapor barrier film.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Rated Air Velocity: 4000 fpm (20.3 m/s).
3. Temperature Range: Minus 20 to plus 210 deg F (Minus 28 to plus 99 deg C).
4. Flame Spread: Less than 25.
5. Smoke Developed: Less than 50.
6. Thermal Conductance: C Factor not more than 0.23.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes to suit duct size.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF DUCTWORK ACCESSORIES

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Where ducts take off mains, and where ducts divide, install splitter dampers or volume dampers, each with adjustable locking quadrant control. Provide volume damper unless splitter damper is indicated. Provide adjustable pivoting splitter with locking quadrant control for all splitter dampers. Provide a volume damper after each splitter damper, located in the branch with the lowest resistance.

C. Concealed dampers that are not accessible shall be controlled by a concealed regulator, type as indicated. Where type is not indicated, provide type as recommended by manufacturer for application. Include flush chrome plated access panel for each.

D. Install turning vanes in all square or rectangular 90º elbows in supply, return, and exhaust air systems, and elsewhere as indicated.

E. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

F. Install flexible ducts only where indicated and only in extended straight lengths not to exceed 36"; bend, sags, or elbows will not be permitted.

G. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 FIELD QUALITY CONTROL

A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.

3.4 ADJUSTING AND CLEANING

A. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers, and adjust for proper action.

B. Final positioning of manual dampers is specified in Division 15 Section, "Testing, Adjusting, and Balancing."

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 23 33 00

SECTION 23 34 23 - POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. The extent of power ventilator work is shown on the drawings and schedules and by the requirements of this section.

B. The types of power ventilators required for the project include the following:

1. Power ceiling exhaust fans

C. Refer to Division 26 sections for electrical connections required in conjunction with power ventilators (not work of this section).

1.3 QUALITY ASSURANCE

A. Manufacturers: Subject to compliance with requirements, provide power ventilators of one of the following:

1. Ceiling Cabinet Exhaust Fans:

a.	ACME	Model V
b.	Greenheck	Model SP
c.	Cook	Gemini Model
d.	Penn	Model Z
e.	Broan	360 Series

B. SMACNA Compliance: Except as otherwise indicated, comply with quality standards and installation details indicated in SMACNA's "Architectural Sheet Metal Manual."

C. AMCA Seals: Provide fans which bear Air Movement and Control Association (AMCA) certified performance rating seals.

D. UL Labels: Provide fans with U.L. labels where standard exists and for other fans provide power ventilator components which have been listed and labeled by Underwriters Laboratories.

E. NEMA Compliance: Comply with applicable portions of National Electrical Manufacturers Association standards for motors and applications indicated.

1.4 SUBMITTALS

A. Manufacturer's Data; Power Ventilators: Submit manufacturer's data on power ventilators, with marks to indicate types and sizes to be provided.

1.5 JOB CONDITIONS

A. Coordinate the installation of power ventilators with work of other trades where penetrations and fastenings of ventilators are required with finished interior and exterior surfaces of walls and ceilings. Attain best possible integration of fan and ventilators with other type work for achieving permanent, waterproof, and neat workmanlike construction.

PART 2 - PRODUCTS

2.1 POWER VENTILATORS

A. General: Except as otherwise indicated, provide standard prefabricated power ventilator units of the type and size shown, modified as necessary to comply with requirements, and as required for a complete installation.

B. Ceiling Cabinet Exhaust Fans: Provide ceiling exhaust ventilators, in types and sizes indicated; locate where shown; rating as scheduled direct-driven fan with permanently lubricated, continuous duty, thermally protected, ball bearing motor. Construct fan housing of sheet steel, with baked-on white enamel finish, lined with sound absorbing acoustical insulation securely fastened to walls of housing for low sone rating. Provide integral backdraft damper which is chatter proof with no metal-to-metal contact; and a true centrifugal wheel with air outlet perpendicular to inlet grille; with statically and dynamically balanced wheel. Provide grille with baked white vinyl finish and 85% free open area; equip motor with integral thermal overload protection and with terminal box mounted on housing with cord, plug, and receptacle inside housing. Provide factory fabricated discharge cap specifically designed for fan and suitable for discharge arrangement indicated. Electrically ground motor.

PART 3 - EXECUTION

3.1 INSTALLATION OF POWER VENTILATORS

A. General: Except as otherwise shown or specified, install power ventilators in accordance with manufacturer's written instructions and in accordance with National Electrical Code (NEC) and recognized industry practices to insure that products serve the intended function.

B. Coordinate power ventilator work with work of roofing and ceilings, as necessary for proper interfacing.

C. Coordinate installation of bathroom fans fitted with radiation/fire damper to maintain fire rating or rated ceiling/floor construction. Confirm fan with damper will fit into available ceiling space.

3.2 ELECTRICAL CONNECTIONS

A. Ensure that power ventilator units are wired properly, with rotation in direction indicated and intended for proper ventilator performance.

B. Provide positive electrical motor grounding.

3.3 TESTING

A. After installation of power ventilators has been completed, test each ventilator to demonstrate proper operation of unit at performance requirements specified, including, but not limited to, proper rotation of impeller. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

END OF SECTION 23 34 23

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate model number and accessories furnished.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products scheduled on the drawings.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

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

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 63 15 - SPLIT-SYSTEM HEAT PUMP UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes split-system air-to-air, R-410A, heat pump units consisting of separate indoor units with evaporator and fan, outdoor units with compressor and condenser components, and programmable room thermostat. Indoor units are designed for vertical or horizontal mounting, and are connected to ducts. Outdoor units are air cooled and designed for pad mounting as indicated. Minimum SEER rating is 15.0.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For split-system heat pump units to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.
2. Fan Belts: One set of belts for each unit with a belt drive.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

		1-1/2 to 5 tons	
		Outdoor Unit	Indoor Unit
1.	Trane	4TTR	TEM4
2.	Lennox	ML17XP1	CBA25UHV

2.2 INDOOR, EVAPORATOR-FAN COMPONENTS (5 TONS OR LESS)

A. Cabinet: Galvanized or enameled steel with removable panels on front and ends in manufacturer's standard color. Provide manufacturer's verification that cabinet leakage does not exceed 2% when tested in accordance with ANSI/ASHRAE Standard 193-2010 "Method of Test for Determining the Air Tightness of HVAC Equipment".

1. Insulation: Faced, glass-fiber, rigid insulation.
2. Drain Pans: Corrosion resistant insulated plastic with connection for drain.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Factory-installed; helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; one-time fuses in terminal box for overcurrent protection; and required heating controls with control circuit transformer.

D. Fan: Direct drive, centrifugal, as indicated. Fan shall be forward-curve, statically and dynamically balanced.

E. Fan Motors: Comply with requirements in Section 23 05 13 – "Common Motor Requirements for Hvac Equipment"

1. Special Motor Features: Constant torque, programmable, multispeed ECM motor.
2. Plug in wiring connections.
3. Internal thermal protection.
4. Permanently mounted.
5. Resiliently mounted.

F. Disposable Filters: 2" thick, pleated, MERV 11.

G. Filter Housing: Designed for 2" thick filter and equipped with access panel/door for easy filter removal/replacement.

H. Single Point Electrical Connections: Units shall have a single point of connection for all electrical power and shall be internally wired at the factory including fan, electric heat, and all required transformers, contactors, etc.

2.3 AIR-COOLED, OUTDOOR COMPRESSOR-CONDENSER COMPONENTS (5 TONS OR LESS)

A. Casing: Galvanized steel, finished with baked enamel in manufacturer's standard color, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Louvered heavy gauge steel panels, or hail guards, on all four sides to prevent damage to the coil.

C. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Scroll.
2. Single stage compressor.
3. Time/temperature defrost control with field adjustable cycle time of 30, 60, or 90 minutes of compressor run time with 30 second (field adjustable) compressor delay.
4. High and low pressure switch monitoring with automatic reset.
5. Compressor sound dampening system consisting of batt insulation and polyethylene cover.

D. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

E. Heat Pump Components: Reversing valve, expansion valve, and low-temperature ambient air cut-off thermostat.

F. Factory installed, 100% molecular-sieve, bead type, bi-flow, liquid line drier.

G. Fan: Aluminum-propeller type, directly connected to motor.

H. Motor: Permanently lubricated, totally enclosed, with integral thermal-overload protection.

I. Low Ambient Kit: Permits cooling operation down to 30 deg F.

J. Crankcase heater.

K. Accessories

1. Thermostat: Electronic, seven day programmable type to control compressor and evaporator fan, with the following features:

    a. Compressor time delay.
    b. 24-hour time control of system stop and start.
    c. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
    d. Two programmed setpoints per day.
    e. Memory retention on loss of power.

2. Automatic-reset timer to prevent rapid cycling of compressor.
3. Freezestat to de-energize the compressor if the refrigerant suction line temperature at the evaporator is below 35 degrees F with automatic reset at approximately 55 degrees F.
4. Fire Protection Thermostats: Provide manual reset type adjustable fire protection thermostats set @ 165^{o}F to automatically shut down the indoor unit fan for the following systems:

    a. Units with a scheduled fan capacity of 2,000 cfm or less that have a recirculating (return air) system and serve all areas used for egress. Locate thermostats in the return air upstream of any connection of exhaust or outside air.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install and connect refrigerant piping to component's fittings. Install piping to allow access to unit and route as indicated on the drawings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Duct Connections: Duct installation requirements are specified in 23 31 13 “Metal Ducts”. Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system heat pump units with flexible duct connectors. Flexible duct connectors are specified in 23 33 00 “Ductwork Accessories".

D. Ground equipment according to 26 05 26 “Grounding and Bonding".

E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

F. Install and connect control wiring. Provide conduit, conductors, and cable in accordance with the requirements of Division 26.

G. Unless specifically indicated otherwise, provide a welded steel angle frame with insulated sheet metal sides and bottom as detailed on the drawings. Connect outside air duct and return air duct to the plenum each with an opposed blade volume damper. Install dampers in an accessible location to allow easy adjustment for test and balance work.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 23 81 26 DUCTLESS SPLIT-SYSTEM HEAT PUMP UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Indoor units are designed for exposed wall mounting and are not connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For ductless split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section, "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate size and location of concrete bases for units. Concrete, reinforcement, and formwork are specified in Division 3 Section, "Cast-in-Place Concrete."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

Manufacturer	Indoor Unit	Outdoor Unit
Daikin	FAQ-TAVJU	RZQ-TAVJU
Trane	NTXWST	NTXSST
Mitsubishi	MSZ-GL	MUZ-GL

B. WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS (INDOOR UNITS)

C. General: The Daikin indoor unit model FXFQ shall be a fan coil unit, operable with R410A refrigerant, equipped with an electronic expansion valve, for mounting on the wall. The supply air shall be distributed by a motorized louver which continuously sweeps up and down when the fan operates. Computerized PID control shall be used to maintain room temperature within 1°F. The indoor units sound pressure shall range from 28 dB (A) to 33 dB (A) at low speed measured at 5 feet below the unit. Each unit’s performance shall be based on scheduled operating conditions.

D. Indoor Unit:

   1. The indoor unit shall be completely factory assembled and tested. Included in the unit shall be factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate

drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory. Contractor to provide refrigerant pipe pressure testing and proper refrigerant charge for all units in the field.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through the concentric panel, which shall include a resin net mold resistant filter.
5. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
6. The indoor units shall be equipped with a return air thermistor.
7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
8. The voltage range will be 253 volts maximum and 187 volts minimum.

E. Unit Cabinet:

1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
2. The units shall have an auto-swing louver to provide efficient air distribution as it modulates up and down while the fan is operating. The louver closes when the fan stops.
3. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

F. Fan:

1. The fan shall be direct-drive cross flow fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.54 to 0.58 HP.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

G. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be completely factory tested.
4. The refrigerant connections shall be flare connections.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 21 inch lift shall be provided below the coil in the condensate pan with a built in safety alarm.
7. A thermistor shall be located on the liquid and gas line.

H. Filters: Permanent, cleanable.

I. Electrical: A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

J. Control:

1. The unit shall have standalone DDC controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to Lon Works networks or interfacing with connection to BMS system.

K. Accessories: Provide the following accessories.

1. Remote “in-room” sensor kit.
2. The wall-mounted, hard-wired, remote sensor kit shall be provided. The sensor for detecting the temperature shall be placed away from the indoor unit (branch wiring shall be provided).

2.2 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS (OUTDOOR UNITS)

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Reciprocating or scroll.
2. Refrigerant: Pre-charged.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).

2.3 ACCESSORIES

A. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection, including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 3 Section, "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install ground-mounting, compressor-condenser components on polyethylene mounting base.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment according to Division 26 Specifications.

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1.

END OF SECTION

SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Codes and Standards: Where indicated, the referenced edition shall govern. Where not indicated, the latest edition shall govern.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Electrical identification.
3. Electricity-metering components.
4. Concrete equipment bases.
5. Control wiring.
6. Electrical demolition.
7. Cutting and patching for electrical construction.
8. Touchup painting.

1.3 SUBMITTALS

A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 DEFINITIONS

A. General Explanation: A substantial amount of the Contract Document Specification language constitutes specific definitions for terms found in other Contract Documents, including the Drawings which must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon. Certain terms used repetitiously in the Contract Documents are defined generally in this Article.

B. General Requirements: The provisions or requirements of the Division 1 Sections. The General Requirements apply to the entire work of the Contract, and where so indicated, to other elements of work which are included in the project.

C. Indicated: The term "Indicated" is a cross reference to details, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar means of recording requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader locate the cross reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by the Architect," "requested by the Architect," etc. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

E. Refer: Used to indicate that the subject is defined or specified in further detail at another location in the Contract Documents, or elsewhere as indicated. Except as otherwise noted, "refer" does not imply that the Contractor must purchase or subcontract the subject work in any special manner.

F. Approve: Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to the limitations of the Architect's responsibilities and duties as specified in the General and Supplementary Conditions. In no case will "approval" by the Architect be interpreted as a release of the Contractor from responsibilities to fulfill the requirements of the Contract Documents.

G. Project Site: The space available to the Contractor for the performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of the project site may or may not be identical with the description of the land upon which the project is to be built.

H. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

I. Install: Except as otherwise defined in greater detail, the term "install" is used to describe operations of the project site including unloading, unpacking, assembly, erection, placing, anchoring, connecting utilities, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

J. Provide: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for the intended use, as applicable in each instance.

K. Installer: The entity (person or firm) engaged by the Contractor or its subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in the operations they are engaged to perform.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 (2020).

1.6 HAZARDOUS MATERIALS

A. Asbestos: No asbestos-containing materials have been identified on items that are indicated to be disturbed. If asbestos-containing materials are encountered, comply with the following:

Upon encountering any previously unidentified materials which he suspects may contain asbestos, the Contractor shall immediately cease all work in the immediate vicinity of the suspected materials and notify the Designer and the Owner. The Owner shall retain consultants to identify the suspected materials. Upon identification, the Owner reserves the right to contract separately for the removal, or require the Contractor to remove said materials in accordance with the following provision. In any case, the work shall be performed by a licensed and certified Abatement Contractor.
The Louisiana Department of Environmental Quality (D.E.Q.) has issued the Louisiana Emission Standards for Hazardous Air Pollutants. Where asbestos is encountered in a project, the Contractor shall comply with all laws and ordinances pertaining to asbestos handling and abatement, including the latest revision of LAC 33:111, Chapter 25, Subchapter F, Emission Standards for Hazardous Air Pollutants, LAC 33:111, Chapter 27, Asbestos Containing Materials in Schools and Public Buildings and LAC 33:111, Chapter 51, Subchapter M, Section 5151, Emission Standards for Asbestos.

Notification should be addressed to:

Asbestos Coordinator
Louisiana Department of Environmental Quality
Air Quality Division
Post Office Box 82135
Baton Rouge, Louisiana 70884-2135

If the Owner chooses to remove any previously unidentified materials by utilizing different Contractors, the Contractor shall cooperate fully with the Owner's consultants and asbestos abatement Contractor permitting them full access to the project, and shall not resume work in the vicinity of the suspected materials until advised by the Designer and the Owner that it is safe to do so.

1.7 COORDINATION

A. The electrical Plans and Specifications are a portion of the entire project. Other portions of the project contain information and requirements that will affect the electrical work. It is the responsibility of the Electrical Contractor to review all of the Contract Documents and to include those requirements in the bid.

B. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work.

D. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16 inch (14 mm) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Expansion Anchors: Carbon-steel wedge or sleeve type.

F. Toggle Bolts: All-steel springhead type.

G. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each cable size.

1. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.

C. Colored Adhesive Marking Tape for Wires, and Cables: Self-adhesive vinyl tape, not less than 3/4 inch wide by 3 mils thick (18 mm wide by 0.08 mm thick).

D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend that indicates type of underground line.

E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16 inch (1.6 mm) minimum thickness for signs up to 20 sq. inch (129 sq. cm) and 1/8 inch (3.2 mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

G. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

H. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396 inch (1 mm), galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4 inch (6 mm) grommets in corners for mounting.

I. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Meter Sockets: Comply with requirements of electrical power utility company.

2.4 CONCRETE BASES

A. Concrete: 3000 psi (20.7 MPa), 28-day compressive strength as specified in *Division 3 Section "Cast-in-Place Concrete."*

2.5 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom, but no less than that required by NEC.

B. Clearances: Coordinate with other trades and/or existing conditions to maintain code required clearances above, below and around electrical equipment.

C. Materials and Components: Install level, plumb, and square to other building systems and components, unless otherwise indicated.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Selection of Supports: Comply with manufacturer's written instructions.

D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200 lb (90 kg) design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps. Clamps less than 7 feet above the floor shall be one-piece without protruding edges or bolts.

F. Install 1/4 inch (6 mm) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2 inch (38 mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports. Support wires shall be dedicated to the support of electrical materials and equipment. Ceiling support equipment and wires are not to be used for the support of electrical equipment. Identify electrical support wires as required by NFPA 70 300.11(A)(2).

H. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers

are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

I. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, and other devices unless components are mounted directly to structural elements of adequate strength. Field galvanize galvanized members that have been field cut.

J. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
5. Steel: Welded threaded studs or spring-tension clamps on steel. No field welding of supports to structural members will be allowed.
6. Light Steel: Sheet-metal screws. Do not penetrate outer skin of building from within.
7. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

F. Color-code 208-120-V three phase system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.

3. Phase C: Blue.

G. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

H. Install engraved-laminated signs with black letters on white background with minimum 3/8 inch (9 mm) high lettering for equipment designations for switchgear or description of load being fed or controlled in the case of disconnects or contactors.

3.5 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Verify and provide equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000 psi (20.7 MPa), 28-day compressive-strength concrete and reinforcement.

3.7 EQUIPMENT AND CONTROL WIRING

A. Wire in and connect every motor and item of equipment furnished as a part of this contract, including those furnished under other Divisions. Provide all required disconnecting means, boxes, conduit, conductors, etc. Motors and equipment furnished under other Divisions will be installed under that Division.

B. Motor starters will be furnished under the division that the motors being controlled are furnished, and will be installed under Division 26 by the Electrical Contractor unless controllers are integral to the equipment. Installation includes mounting, connection to power and grounding.

C. Control Wiring: All control wiring and interlock wiring is included in Division 23.

3.8 DEMOLITION

A. Protect existing electrical equipment and installations not indicated to be removed. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, appearance and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Existing Work to Remain: Maintain feed, or provide new feed to equipment and devices that are not being removed.

E. Remove demolished material from project site.

F. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.9 SEQUENCING AND SCHEDULING

A. Electrical power and system interruptions shall be held to a minimum and will be permitted only at times approved by the Owner. The Owner may require that any interruptions be during nights, weekends, holidays, etc. Provide any required overtime work at no additional cost to Owner.

B. Do not interrupt feed to any service, feeder or branch circuit feeding facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to make temporary provisions where required according to requirements indicated:

1. Notify Owner no fewer than seven (7) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.
3. Provide all temporary facilities and services, including fire watch, required to maintain operation, security, and life safety.

3.10 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.11 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical identification.
3. Electricity-metering components.
4. Concrete bases.
5. Electrical demolition.
6. Cutting and patching for electrical construction.

7. Touchup painting.

3.12 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint:

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.13 CLEANING AND PROTECTION

A. Upon completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 05 19 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Field Quality-Control Test Reports: From Contractor.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 (2020).

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers:

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Senator Wire & Cable Company.
4. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5 or 7; stranded or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN or XHHW complying with NEMA WC 5 or 7 as applicable.

2.2 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.
6. Ideal

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Push in splice and insulation displacement type connectors shall not be used.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance, Feeders and Branch Circuits: Type THHN-THWN or XHHW single conductors in raceway. Minimum size #12 AWG or larger where required for voltage drop. Where branch circuits exceed 100 feet in length, use minimum #10 AWG.

B. Class 1 Control Circuits: Type THHN-THWN, in raceway. Minimum size #14 AWG.

C. Class 2 Control Circuits: Type THHN-THWN, in raceway or Power-limited cable in raceways. Size as recommended by equipment manufacturer.

3.2 INSTALLATION

A. Run all conductors in raceways unless specifically indicated otherwise.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods."

E. No more than three current carrying phase conductors (excluding switch legs and grounding conductors), and one grounded conductor, may be installed in any raceway.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Test Reports: Submit written test reports to include the following:

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.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (2014), Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.
2. Comply with NFPA 70 (2020).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connections, and Rods:

a. Apache Grounding/Erico Inc.

b. Chance/Hubbell
c. Copperweld Corp.
d. Erico Inc.; Electrical Products Group
e. Ideal Industries, Inc.
f. ILSCO
g. Kearney/Cooper Power Systems
h. O-Z/Gedney Co.; a business of the EGS Electrical Group
i. Raco, Inc.; Division of Hubbell
j. Thomas and Betts, Electrical

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section 16120, "Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B8.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Twist-on Connectors: Plastic body with coiled copper alloy wire forming threads.

D. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

E. Underground Mechanical Connectors: Bolted-pressure type or compression type, listed for underground application.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, ¾" dia. by 120 inches long.

B. Ground Rods: Sectional type; copper-clad steel.

1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted clamp type or compression connectors for conductors larger than 10 AWG. Use Plastic body twist-on connectors for 10AWG and smaller.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

3.3 INSTALLATION

A. Ground Rods:

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
2. Electrical Service Grounding Electrode Applications: Install at least three (3) rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes; install in as straight line as conditions permit. Interconnect ground rods with grounding electrode conductors. Use exothermic welds. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding 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.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the 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. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each 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.

    a. Equipment Rated 500 kVA and Less: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 33 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section "Basic Electrical Materials and Methods," for supports, anchors, and identification products.
2. Division 26 Section "Wiring Devices," for devices installed in boxes.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

F. Fixture Whip: Flexible wiring as specified from box to individual lighting fixture.

1.4 SUBMITTALS

A. Product Data: For raceways, and fittings, floor boxes enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 (2020).

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING AND RACEWAY SYSTEMS

A. Manufacturers:

1. Anamet Electrical, Inc.; Anaconda Metal Hose.
2. Electri-Flex Co.
3. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
4. LTV Steel Tubular Products Company.
5. Manhattan/CDT/Cole-Flex.
6. O-Z Gedney; Unit of General Signal.
7. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1. U. L. 6. Threaded with threaded fittings.

C. IMC: ANSI C80.6. U.L. 1242.

D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

E. Plastic-Coated IMC and Fittings: NEMA RN 1.

F. EMT and Fittings: ANSI C80.3. U.L. 797.

1. Fittings, 2 Inch Diameter and Larger: Steel (not die cast) set-screw or compression type.
2. Fittings, Smaller than 2 Inches Diameter: Compression type.

G. FMC: Zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.

7. ElecSYS, Inc.
8. Lamson & Sessions; Carlon Electrical Products.
9. Manhattan/CDT/Cole-Flex.
10. RACO; Division of Hubbell, Inc.
11. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.3 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

1. Manufacturers:

a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
b. Thomas & Betts Corporation.
c. Walker Systems, Inc.; Wiremold Company (The).
d. Wiremold Company (The); Electrical Sales Division.

2.4 BOXES

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Floor Boxes: Cast metal with brass flip-lid covers matching indicated devices. All boxes in slab-on-grade applications shall be cast metal type.

2.5 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Use the following raceways for outdoor installations:

1. Exposed: IMC.
2. Concealed: IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Use the following raceways for indoor installations:

1. Exposed in Unfinished Areas: EMT. Use IMC or Rigid Steel Conduit for locations subject to mechanical damage.
2. Exposed in finished areas: Surface metal raceway where concealment is impossible. Limit use to the least possible. The impossibility of concealment is in the opinion of the Architect.
3. Concealed: EMT.
4. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
5. Damp or Wet Locations: IMC.
6. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

C. Minimum Raceway Size: 1/2-inch trade size (DN 14) unless noted. 3/8-inch factory assembled, flexible steel "fixture whips," a maximum of 60 inches long, may be used to feed individual lay-in LED lighting fixtures.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.2 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water piping.

B. Do not support electrical equipment or raceways from ceiling grid or ceiling grid supports. Independently support all equipment and raceways directly from structural elements.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

E. Install temporary closures to prevent foreign matter from entering raceways.

F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

H. Conceal raceways within finished walls and ceilings unless concealment is impossible or where otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2 Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 meters) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Flexible Connections: Use maximum of 60 inches (1725 mm) of flexible conduit for recessed and semirecessed lighting fixtures. Use maximum of 12 inches (35 mm) of flexible conduit for

equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

Q. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

R. Set floor boxes level and flush with finished slab surface.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor photoelectric switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Lighting plan showing location, orientation, and coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 (2020).

PART 2 - PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.2 TIME SWITCHES

A. Manufacturers:

1. Grasslin Controls Corporation.
2. Intermatic, Inc.
3. TORK.

B. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.

1. Contact Configuration: DPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Program: Single channel, 2 on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Area Lighting Research, Inc.
2. Fisher Pierce.
3. Grasslin Controls Corporation.
4. Intermatic, Inc.
5. Paragon Electric Co.
6. TORK.

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the North sky exposure.

2.4 SWITCH-BOX OCCUPANCY SENSORS

A. Manufacturers:

1. Leviton Mfg. Company Inc.
2. Lightolier Controls; a Genlyte Company.
3. Lithonia Lighting.
4. Novitas, Inc.

5. Sensor Switch, Inc.
6. Watt Stopper (The).

B. Description: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.

1. Include ground wire.
2. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and 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 shall be powered from the relay unit.
4. Relay Unit: 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. Power supply to sensor shall be 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 though a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
7. Bypass Switch: Override the on function in case of sensor failure.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch (150-mm) minimum movement of any portion of a human body that presents a target of at least 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving at least 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. feet (93 sq. meters) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.5 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 26 Section, "Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 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 Division 26 Section, "Conductors and Cables." Minimum conduit size shall be 1/2 inch (13 mm).

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.

D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section, "Basic Electrical Materials and Methods."

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 26 09 26 - LIGHTING CONTROL PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes manually operated lighting controls with relays and control module.

B. Related Sections:

1. Division 26 Section "Lighting Control Devices" for time clocks, photoelectric sensors, occupancy sensors, and multipole contactors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: 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. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.

C. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

D. Field quality-control reports.

E. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.

F. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer.

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 47 CFR, Subparts A and B, for Class A digital devices.

D. Comply with NFPA 70 (2014).

1.5 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.

B. Coordinate lighting control components specified in this Section with components specified in Division 26 Section "Panelboards."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship or from transient voltage surges within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of software input/output to execute switching or dimming commands.
b. Failure of modular relays to operate under manual or software commands.
c. Damage of electronic components due to transient voltage surges.

2. Warranty Period: Two years from date of Substantial Completion.
3. Extended Warranty Period Failure Due to Transient Voltage Surges: Eight years.
4. Extended Warranty Period for Electrically Held Relays: 10 years from date of Substantial Completion.

1.7 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of the software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acuity Brands Lighting, Inc.; Lithonia Lighting brand.
2. Intelligent Lighting Controls.
3. Leviton Mfg. Company Inc.
4. Lighting Control & Design, Inc.

5. Lightolier Controls; a division of Genlyte Group, LLC.
6. Lutron Electronics Co., Inc.
7. Musco Lighting.
8. NexLight; part of the Northport Engineering Group.
9. Square D; a brand of Schneider Electric.
10. Starfield Controls, Inc.
11. Touch-Plate Technologies.
12. Triatek, Inc.
13. Watt Stopper/Legrand?.

2.2 SYSTEM REQUIREMENTS

A. Expandability: System shall be capable of increasing the number of control functions in the future by 25 percent of current capacity; to include equipment ratings, housing capacities, spare relays, terminals, number of conductors in control cables, and control software.

B. Performance Requirements: Manual switches, an internal timing and control unit, and external sensors or other control signal sources send a signal to a PC-based network-system control module that processes the signal according to its programming and routes an open or close command to one or more relays in the power-supply circuits.

2.3 CONTROL MODULE

A. Control Module Description: Comply with UL 916 (CSA C22.2, No. 205); microprocessor-based, solid-state, 365-day timing and control unit. Output circuits shall be switched on or off by internally programmed time signals or by program-controlled analog or digital signals from external sources. Output circuits shall be pilot-duty relays compatible with power switching devices. An integral keypad shall provide local programming and control capability. A key-locked cover and a programmed security access code shall protect keypad use. An integral alphanumeric LCD or LED shall display menu-assisted programming and control.

2.4 POWER DISTRIBUTION COMPONENTS

A. Modular Relay Panel: Comply with UL 508 (CAN/CSA C22.2, No. 14) and UL 916 (CSA C22.2, No. 205); factory assembled with modular single-pole relays, power supplies, and accessory components required for specified performance.

1. Cabinet: Steel with hinged, locking door.

    a. Barriers separate low-voltage and line-voltage components.
    b. Directory: Mounted on back of door. Identifies each relay as to load groups controlled and each programmed pilot device if any.
    c. Control Power Supply: Transformer and full-wave rectifier with filtered dc output.

2. Single-Pole Relays: Mechanically held unless otherwise indicated; split-coil, momentary-pulsed type.

    a. Low-Voltage Leads: Plug connector to the connector strip in cabinet and pilot light power where indicated.
    b. Rated Capacity (Mounted in Relay Panel): 20 A, 125-V ac for tungsten filaments; 20 A, 277-V ac for ballasts.
    c. Endurance: 50,000 cycles at rated capacity.
    d. Mounting: Provision for easy removal and installation in relay cabinet.

B. Line-Voltage Surge Suppression: Factory installed as an integral part of 120-AC, solid-state control panels.

2.5 MANUAL ANALOG SWITCHES AND PLATES

A. Push-Button Switches: Modular, momentary-contact, low-voltage type.

1. Match color specified in Division 26 Section "Wiring Devices."
2. Integral green LED pilot light to indicate when circuit is on.
3. Internal white LED locator light to illuminate when circuit is off.

B. Wall Plates: Single and multigang plates as specified in Division 26 Section "Wiring Devices."

C. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Division 16 Section "Conductors and Cables."

B. Classes 2 and 3 Control Cables: Stranded copper, complying with UL 83, multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Division 26 Section "Conductors and Cables."

C. Class 1 Control Cables: Stranded copper, complying with UL 83, multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Division 26 Section "Conductors and Cables."

D. Structured Network Digital and Multiplexed Signal Cables: UTP cable with copper conductors, complying with TIA/EIA-568-B.2, Category 6 for horizontal copper cable and with Division 27 Section "Voice and Data Communications Cabling."

PART 3 - EXECUTION

3.1 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install wiring in raceways. Minimum conduit size shall be 1/2 inch (13 mm).

1. For power wiring comply with Division 26 Section "Conductors and Cables."
2. For digital data transmission and low-voltage (operating at less than 50 V) remote control and signaling cables, comply with Division 26 Section "Voice and Data Communication Cabling."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes.

F. Identify components and power and control wiring according to Division 26 Section "Basic Electrical Materials and Methods."

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Test for circuit continuity.
2. Verify that the control module features are operational.
3. Check operation of local override controls.
4. Test system diagnostics by simulating improper operation of several components selected by Architect.

C. Lighting controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 SOFTWARE INSTALLATION

A. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current licenses for software.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting controls and software training for PC-based control systems. See Division 1 Section "Demonstration and Training."

END OF SECTION 23 09 26

SECTION 26 09 43 - DIGITAL-NETWORK LIGHTING CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. System Software Interfaces.
2. System Backbone and Integration Equipment.
3. Wired Networked Devices.
4. Wireless Networked Devices.

B. Related Requirements:

1. Division 26: Section "Basic Electrical Materials and Methods" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Division 26 Section "Wiring Devices" for wired switches and dimmers and other Project requirements applicable to Work specified in this Section.

1.3 DEFINITIONS

A. Data Bus: A wired interface used to communicate with connected devices.

B. Device: A collective term for bus or wireless connected devices, including fluorescent ballasts, LED drivers, incandescent luminaires, manual switches, switching relays, sensors, and similar.

C. Global: Communication between devices in otherwise separate spaces using a bridging device or system controller.

D. Group: A set of devices that communicate together.

E. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

F. Scene: Digital light level associated with a preset.

G. System Backbone: Devices used to connect and manage otherwise separate spaces, including bridging devices and gateways or system controllers. Used to expose devices to software configuration via TCP/IP.

1.4 SUBMITTALS

A. Product Data:

1. Bill of Materials necessary to install the networked lighting control system.
2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
3. Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems.
4. Other Diagrams and Operational Descriptions - as needed to indicate system operation or interaction with other system(s).

B. Shop Drawings:

1. Riser Diagrams showing device wiring connections of system backbone and typical per room/area type.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

E. Maintenance Contracts:

1. Hardware and Software Operation Manuals
2. Maintenance service agreement.
3. Software service agreement.

F. Warranty documentation.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Phone Support: Toll-free technical support available from manufacturer through an online tool to schedule a technical support appointment and provide 24/7 emergency support.
2. Remote Support: Manufacturer capable of providing remote support and ability to virtually connect with customers to address issues with visual guidance overlaid on images of real-world objects.
3. Cellular Connectivity: Manufacturer capable of cellular connectivity to a networked lighting control systems available to provide remote support within the continental United States.
4. On-Site Support: Manufacturer capable of providing a 72-hour, on-site response time within the continental United States.
5. Service Contracts: Manufacturer capable of providing service contracts for continued on-site and remote support of the lighting control system post-installation for terms up to 10 years from substantial completion, including:

a. Remote and on-site emergency response.
b. Remote system performance checks.
c. Remote diagnostics.

d. Replacement parts.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control hardware.
b. Faulty operation of lighting control firmware.

2. Minimum Warranty Period: Five years from date of shipment.

PART 2 - PRODUCTS

2.1 SYSTEM COMPLIANCE

A. System components manufactured in accordance with UL 916 and UL 924 standards where applicable.

B. System components manufactured in accordance with CFR Title 47, Part 15 standards where applicable.

C. System components manufactured in accordance with ISED Canada RSS-247 standards where applicable.

D. System components manufactured in accordance with IFT-008-2015 and NOM-208-SCFI-2016 standards where applicable.

E. System listed as qualified under DesignLights Consortium Networked Lighting Control System Specification v5.0.

F. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

A. System Architecture:

1. System architecture based upon the following concepts:

a. Networkable intelligent lighting control devices.
b. Standalone lighting control zones using distributed intelligence.

c. Optional system backbone for remote, time-based, and global operation.

2. Intelligent lighting control devices with individually addressable network communication capability and having one or more basic lighting control components including: occupancy sensor, photosensor, relay, dimming output, contact closure input, analog 0-10 V(dc) input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure permissible to minimize overall system device count.
3. System capable of interfacing directly with networked luminaires such that either low-voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches, and system backbone.
4. Networked luminaires and intelligent lighting control devices support individual (unique) configuration of device settings and properties, with such configuration residing within the networked luminaires and intelligent control devices.
5. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices capable of providing automatic control from sensors (occupancy and/or photosensor) and manual control from local wall stations without requiring connection to a higher-level system backbone.

    a. Lighting control zones (wired and wireless) support at least 128 devices per zone.
    b. Capable of being networked with a higher-level system backbone to provide time-based control, control from inputs or systems external to control zone, and remote configuration and monitoring through a software interface.

6. Networked luminaires and intelligent lighting control devices with distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones operate according to their defined default settings and sequence of operations.
7. System to include one or more system controllers that provide time-based control.
8. System controller provides means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP or BACnet MS/TP protocol.
9. System controller supports both low-voltage wired and wireless RF communication within a single controller device.
10. System devices support firmware update, either remotely or from within the application space, for purposes of upgrading functionality at a later date.
11. System capable of reporting lighting system events and performance data to management software for display and analysis.

B. Wired Networked Control Zone Characteristics:

1. Connections to devices within a wired networked lighting control zone and to backbone components accomplished with a single type of low-voltage network cable, compliant with CAT5e specifications or higher. Use of mixed types of low-voltage network cables is unacceptable.
2. Devices connected in "daisy-chain" topology. "Hub-and-spoke" topology, requiring all individual networked devices to be connected to a central component, is unacceptable, to reduce the total amount of network cable required for each control zone.
3. Pre-terminated, plenum-rated, low-voltage network cabling supplied with hardware.
4. Following proper installation and provision of power, all networked devices connected with low-voltage network cable must automatically form a functional lighting control

zone without requiring any type of programming, regardless of the programming mechanism (e.g. software application, handheld remote, pushbutton).

a. The "out of box" default sequence of operation is intended to provide typical sequence of operation to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.

5. System software capable of automatic discovery of all connected devices without requiring any provisioning of system or zone addresses.
6. Networked devices capable of detecting improper communication wiring and LED notification to alert installation/startup personnel.
7. Networked control devices suitable for control of egress or emergency light sources without additional, externally mounted UL 924 shunting or 0-10 V(dc) disconnect devices, to provide a compliant sequence of operation while reducing the overall installation and wiring costs of the system. Capable of supporting the following sequence of operation:

   a. Low-Voltage Power Sensing: Devices automatically provide 100 percent light level upon detection of loss of power sensed via low-voltage network cable connection where applicable.
   b. Line-Voltage Power Sensing: Devices listed as UL 924 emergency relays which automatically close load-control relay and provide 100 percent light output upon detection of loss of power sensed via line voltage connection to normal power.

8. Global Control Zones: Networked luminaires and intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.
9. Wired Networked Wall Station Scene-Control Capabilities:

   a. Preset Scenes that activate a specific combination of light levels across multiple local and global channels.
   b. Local Profile Support: Profile Scenes that modify the sequence of operation for devices in the area (group) in response to a button press to dynamically optimize occupant experience and lighting energy usage.
      1) Wall stations able to manually start and stop local profiles, or local profile capable of ending after a specific duration of time between five minutes and 12 hours.
      2) Configurable Parameters:

         a) Fixture light level.
         b) Occupancy time delay.
         c) Response to occupancy sensors (including enabling/disabling response).
         d) Response to daylight sensors (including enabling/disabling response).
         e) Enabling/disabling wall stations.

c. Three-Way or Multi-Way Control: Multiple wall stations capable of controlling the same local and global control zones, to support "multi-way" preset scene and profile scene control.

C. Wireless Networked Control Zone Characteristics:

1. No wired connections between networked devices required for the purposes of system communications.
2. Multiple wireless networking protocols supported:

   a. Standards-based, distributed star topology type of protocol for 900 MHz communication, to support lighting control applications and IoT applications.
   b. Bluetooth standard protocol for 2.4 GHz communication that supports direct connection to smartphone or tablet, to support device configuration, control applications, and IoT without requiring the use of a system backbone.

3. Wireless network must be self-healing, such that the loss of backbone or local communication between devices does not result in the loss of local control of lights in the space.
4. Wireless network communication must support uniform and instant response such that all luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wall station signal.
5. Communication of control signals from sensors and wall stations to networked luminaires and wireless load-control devices occur directly, without any communication, interpretation, or translation of information through a backbone device such as a wireless access point, communication bridge, or gateway.
6. All wireless communication between lighting control components supports the following five tiers of security measures.

   a. Data encryption.
   b. Firmware protection.
   c. Tamper-proof hardware.
   d. Authenticated user access.
   e. Mutual device authentication.

7. Wireless devices use AES encryption to secure communication with a unique encryption key generated for each programmed site.
8. Wireless devices use signed firmware to ensure that unmodified, authentic software is always installed.
9. Wireless networked devices capable of communicating a minimum distance of 150 ft. (45 m) between devices under typical site conditions accounting for typical environmental conditions and building construction materials encountered within commercial indoor lighting environments.
10. Minimum Line-of-Sight Communication Range: 1000 ft. (304 m) under ideal environmental conditions.
11. Wireless devices self-identify when communication to system controller cannot be accomplished or when communication to the system controller is lost.

    a. Self-identification not required for wireless switches or battery-powered devices.

12. Wireless devices self-establish connection to system controller through other devices if direct communication cannot be accomplished or when communication to system controller is lost.

    a. Communication path formation to utilize existing, wireless networked devices located between system controller and respective end devices.
    b. No additional hardware for formation of networked communication path between a system controller and end devices required.
    c. Automatic connection not required for wireless switches or battery-powered devices.

13. Networked control devices suitable for control of egress or emergency light sources without additional, externally mounted UL 924 shunting or 0-10 V(dc) disconnect devices, to provide a compliant sequence of operation while reducing the overall installation and wiring costs of the system. Capable of supporting the following sequence of operation:

    a. Line-Voltage Power Sensing: Devices listed as UL 924 emergency relays that automatically close load-control relay and provide 100 percent light output upon detection of loss of power sensed via line voltage connection to normal power.
    b. Normal-Power-Broadcast Sensing: Devices listed as UL 924 emergency relays that automatically close load-control relay and provide 100 percent light output upon loss of a wireless normal-power broadcast from devices connected to normal power.

D. System Integration Capabilities:

1. Capable of interface with third-party building management systems (BMS) to support two-way communication using BACnet/IP protocol, BACnet MS/TP protocol, and RESTful API including the following system integration capabilities:

    a. "Write" messages for control of individual devices, including control of relay and dimming output.
    b. "Write" messages for control of groups of devices through a single command, including control of relay and dimming output of all devices.
    c. "Read" messages for individual device status information.
        1) Available status will vary based on device type and capabilities, which may include relay state, dimming output, power measurement, occupancy sensor status, and photosensor light measurement.

    d. "Read" messages for group status information for occupancy, relay state, and dimming output.
    e. Activation of pre-defined system Global Profiles.

2. Activation of Global Profiles from third-party systems via dry contact closure output signals or digital commands via RS-232 or RS-485.
3. Activation of demand response levels from Demand Response Automation Servers (DRAS) via OpenADR 2.0a protocol.

E. Supported Sequence of Operations:

1. Control Zones:

a. Local Control Zones: Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) capable of transmitting and tracking occupancy sensor, photosensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within area. These will also be referred to as local control zones.

b. Adjacent Control Zones: Networked luminaires and intelligent lighting control devices capable of tracking occupancy broadcasts from adjacent zones. When this feature is enabled, luminaire output for a vacant zone will reduce to a configurable dimmed state if one or more adjacent zones are occupied. Luminaires will turn off when both primary and adjacent zones are vacant.

c. Global Control Zones: Networked luminaires and intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span across multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.

2. Wall Station Capabilities:

a. Wall stations support the following capabilities:
   1) On/Off of a local or global control zone.
   2) Continuous dimming control of light level of a local or global control zone.

b. Multi-Way Control: Multiple wall stations capable of controlling the same local or global control zones, to support "multi-way" switching and dimming control.

3. Occupancy Sensing Capabilities:

a. Occupancy sensors configurable to control a local or global zone.

b. Multiple occupancy sensors capable of controlling the same local or global zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones.

c. Occupancy sensing sequence of operation modes:
   1) On/Off Occupancy Sensing.
   2) Partial-On Occupancy Sensing.
   3) Partial-Off Occupancy Sensing.
   4) Vacancy Sensing (Manual-On / Automatic-Off).

d. On/Off, Partial-On, and Partial-Off Occupancy Sensing Modes Sequence of Operation:
   1) Occupancy automatically turn lights on to a designated level when occupancy is detected. Designated occupied light level support at least 100 dimming levels.
   2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.

3) System capable of combining Partial-Off and Full-Off operation by dimming lights to a designated level when vacant and turning the lights off completely after an additional time delay.
4) Photosensor readings, if enabled in occupancy sensing control zone, automatically adjust light levels during occupied or unoccupied conditions as necessary.
5) Wall station activation changes the dimming level or turn lights off as selected by the occupant. Lights optionally remain in this manually specified light level until the zone becomes vacant. Upon vacancy, normal sequence of operation resumes.

e. Vacancy Sensing or Manual-On/Automatic-Off Mode Sequence of Operation:
1) Activation of a wall station is required turn lights on. System capable of programming the zone to turn on to either a designated light level or previous user-set light level. Initially occupying the space without using a wall station must not result in lights turning on.
2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
3) System capable of dimming the lights when vacant and then turning the lights off completely after an additional time delay.
4) System capable of an "automatic grace period" immediately following detection of vacancy, during which time any detected occupancy results in the lights reverting to the previous level. After the grace period has expired, the use of a wall station is required to turn lights on.
5) Photosensor readings, if enabled in the Occupancy Sensing control zone, capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary.
6) Wall station interaction changes the dimming level or turn lights off as selected by occupant. Lights remain at manually specified light level until zone becomes vacant; normal sequence of operation resumes upon vacancy.

f. Occupancy time delays before dimming or shutting off lights separately programmable for all control zones from 15 seconds to 2 hours.

4. Photosensor Sensing Capabilities (Automatic Daylight Sensing):

a. Photosensor devices configurable to control a local zone.
b. Photosensor-Based Control:
1) Continuous Dimming: Control zone automatically adjusts dimming output in response to photosenor readings, to maintain a minimum light level consisting of both electric light and daylight sources. Photosensor response configurable to adjust set point and dimming rates.

5. Schedule Capabilities:

a. System capable of time schedules for time-of-day to override devices including offsets from dusk and dawn.
b. System capable of providing a visible "blink warning" five minutes prior to the end of the schedule.

c. Wall stations may be programmed to provide timed extensions/overrides that turn the lights on for an additional time period.
   1) Timed override/extension duration programmable for each individual device, zone of devices, or customized group of devices, from five minutes to 12 hours.

6. Global Profile Capabilities:

   a. System capable of automatically modifying the sequence of operation for selected devices in response to any of the following:
      1) Time-of-day schedule.
      2) Contact closure input state.
      3) Manually triggered wired wall station input.
      4) RS-232/RS-485 command to wired input device.
      5) BACnet input command.

   b. Global Profile Capabilities:
      1) Global Profiles stored within and executed from the system controller (via internal timeclock). Dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles.
      2) Global Profile time-of-day schedules capable of recurrence settings including daily, specific days of week, every "n" number of days, weekly, monthly, and yearly. Lighting control global profile schedules support definition of start date, end date, end after "n" recurrences, or never ending.
      3) Daylight savings time adjustments capable of being performed automatically, if desired.
      4) Global Profile holiday schedules follow recurrent settings for specific U.S. holiday dates regardless if they always occur on a specific date or are determined by day/week of the month.
      5) Global Profiles capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times automatically derived from location information using an astronomical clock.
      6) Software management interface capable of displaying a graphic calendar view of profile schedules for each control zone.
      7) Global Profiles capable of manual activation directly from system controller, specially programmed wired input devices, scene-capable wired wall stations, and software management interface.
      8) Global Profiles selectable to apply to a single device, zone of devices, or customized group of devices.
      9) Global Profile Configurable Parameters:

         a) Fixture light level.
         b) Occupancy time delay.
         c) Response to occupancy sensors (including enabling/disabling response).
         d) Response to daylight sensors (including enabling/disabling response).
         e) Enabling/disabling of wall stations.

   c. Local and Global Profiles backed up and stored on software's host server such that Profile backup can be applied to a replacement system controller or wired wall station.

7. System supports automated demand response capabilities with automatic reduction of light level to at least three levels of demand response, configurable for each output device.

2.3 SYSTEMS SOFTWARE INTERFACES

A. Management Interface:
   1. Web-based management interface for remote system control, live status monitoring, and configuration of lighting control settings and schedules.
   2. Compatible with industry-standard web browser clients.
   3. Minimum of 100 unique password-protected user accounts.
   4. Minimum of three user permission levels: read-only, read and change settings, and full administrative system access.
   5. Capable of restricting access for user accounts to specific devices within the system.
   6. All system devices capable of being given user-defined names.
   7. Device identification information displayed in the Management interface including:
      a. Model number.
      b. Model description.
      c. Serial number or network ID.
      d. Manufacturing date code.
      e. Custom label.
      f. Parent network device.
   8. Management interface capable of displaying live status of a networked luminaire or intelligent control device including:
      a. Luminaire on/off status.
      b. Dim level.
      c. Power consumption.
      d. Device temperature.
      e. PIR occupancy sensor status.
      f. Microphonic occupancy sensor status.
      g. Remaining occupancy time delay.
      h. Photosensor reading.
      i. Active Profiles.
   9. Management interface capable of displaying and modifying the current active settings of a networked luminaire or intelligent control device including:
      a. Dimming trim levels.
      b. Occupancy sensor and photosensor enable/disable.
      c. Occupancy sensor time delay and light level settings.
      d. Occupancy sensor response (normal or vacancy).
      e. Photosensor setpoints and transition time delays.
   10. Management interface capable of applying settings changes for a zone of devices or a group of selected devices using a single action that does not require the user to apply settings changes for each individual device.
   11. Management interface capable of compiling a printable network inventory report.
   12. Management interface capable of compiling a printable report detailing all system profiles.
   13. All sensitive information stored encrypted.
   14. System software updates available for automatic download and installation via the Internet.

B. System Energy Analysis and Reporting:

1. Intuitive graphical screens to facilitate simple viewing of system energy performance.
2. Energy Scorecard: Summarized display that indicates calculated energy savings in dollars or KWh.
3. Software calculates allocation of energy savings by control measures including occupancy sensors, photosensors, and manual switching.
4. Energy savings data calculated for the system as a whole.
5. Time-scaled graph showing all relay transitions.
6. Time-scaled graph showing zone occupancy time delays.
7. Time-scaled graph showing the total light level.
8. Software capable of storing information remotely onto an open-source, object-relational database, such as PostgreSQL.
9. Data stored in the database will be accessed utilizing an open standard, application programming interface, such as Open Database Connectivity (ODBC).

C. Visualization and Programming Interfaces:
   1. System provides an optional web-based visualization interface that displays a graphical floorplan.
   2. Graphical floorplan will offer the following types of system visualization:
      a. Full Device Option: Master graphic of entire building, by floor, showing each control device installed with zones outlined including:
         1) Controls embedded light fixtures.
         2) Controls devices not embedded in light fixtures.
         3) Daylight sensors.
         4) Occupancy sensors.
         5) Wall switches and dimmers.
         6) Scene controllers.
         7) Networked relays.
         8) Wired bridges.
         9) System Controllers.
         10) Wired relay panels.
         11) Group outlines.
      b. Group-Only Option: Master graphic of the entire building, by floor, showing only control groups outlined.
      c. Pan and zoom commands supported to allow smaller areas to be displayed on a larger scale simply by panning and zooming each floor's master graphic.
      d. Selecting any control device displays the following as applicable:
         1) Device catalog number.
         2) Device name and custom label.
         3) Device diagnostic information.
         4) Link to further information on device including status or current configuration.
   3. Programming capabilities through the application will include the following:
      a. Switch, occupancy sensor, and photosensor zone configuration.
      b. Manual-on or automatic-on modes.
      c. Turn-on and dim to dimming levels.
      d. Occupancy sensor time delays and PIR sensitivity.
      e. Dual technology occupancy sensors sensitivity.
      f. Photosensor calibration adjustment and auto-setpoint.
      g. Multiple photosensor zone offset.
      h. Trim level settings.
      i. Preset scene creation and copy for scene-capable devices.

j. Application of custom device labels to the Bluetooth Low-Energy Programming Devices and individual connected lighting control devices.
k. Fade rate settings.

D. Smartphone Programming Interface for Wired and Wireless Devices:
1. Interface provided for both Apple iOS and Android operating systems that allows configuration of lighting control settings.
2. Application supports configuration of wireless networked control devices.
a. Application access granted with valid user name and password.
b. Access to program information governed by permission system that allows users to share access with other users and restrict access to those who should not be able to reconfigure the equipment.
c. Indication of signal strength where multiple Bluetooth Low-Energy Programming Devices are available for configuration.
3. Application supports configuration or wired networked control devices.
a. Connected device access granted through user-defined passcode at initial install.
b. Indication of signal strength where multiple Bluetooth Low-Energy Programming Devices are available for configuration.
4. Programming Capabilities:
a. Switch, occupancy sensor, and photosensor group configuration.
b. Manual-on or automatic-on modes.
c. Turn-on and dim to dimming levels.
d. Occupancy sensor time delays and PIR sensitivity.
e. Dual technology occupancy sensors sensitivity.
f. Photosensor calibration adjustment and auto-setpoint.
g. Multiple photosensor zone offset.
h. Trim level settings.
i. Preset scene creation.
j. Application of custom device labels for individual connected lighting control devices.
k. Fade rate settings.

2.4 SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

A. System Controller: Multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nECY or comparable product by one of the following:
a. Cooper Industries, Inc.
b. Leviton Manufacturing Co., Inc.
2. System Controller Processor: 32-bit microprocessor operating at a minimum of 1 GHz.
3. System Controller Memory: Minimum of 512MB memory, with a minimum of 4GB non-volatile flash, to support operating system and databases.
4. System Controller Functions:
a. Time-based control of downstream wired and wireless network devices.
b. Linking into an Ethernet network.
c. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
d. Connection to various software interfaces, including management interface, historical database and analytics interface, and visualization interface.
5. Integral web server to support system controller configuration and diagnostics.

a. Web Server Control Interface:
    1) Display associated devices within the context of a graphical floorplan.
    2) Provide control of output-capable devices through virtual sliders, toggle buttons, preset level widgets, and transparent layers on floorplan.
    3) Control Capabilities:

        a) Control of individual output devices, including control of relay state and analog dimming level where applicable.
        b) Control of local lighting control zones, including control of relay state and analog dimming level where applicable.
        c) Control of global lighting control zones, including control of relay state and analog dimming level where applicable.
        d) Control of Global Profiles.

b. Visualization Interface:
    1) Customizable display with the ability to superimpose colored, transparent layers representing real-time property values, including occupancy status, dimming level status, light level status, and online or offline status where applicable.
    2) Ad hoc display of trended information via an intuitive values-over-time graph.
    3) Report Creation:

        a) Reports accept and graphically display trended status datasets for creator selected devices or zones of devices.
        b) Report information displayed over a user-defined interval and date range.
        c) Reports exportable to a standard CSV format.

6. Graphical touch screen to support configuration and diagnostics.
7. Minimum of three RJ-45 networked lighting control ports for connection to any of the following:
    a. Graphical touch screen.
    b. Wired communication bridges.
    c. Direct connection to networked wired luminaires and intelligent lighting control devices (up to 128 total devices per port).
8. Device will automatically detect all network-connected devices.
9. Capable of managing and operating a minimum of 750 networked devices (wired or wireless) per system controller.
10. Multiple System Controllers capable of connection via LAN for scalability to a minimum of 20,000 networked devices.
11. Supports BACnet/IP and BACnet MS/TP protocols to directly interface with BMS and HVAC equipment without additional protocol translation gateways.
    a. BACnet MS/TP Connection Speed: 9600 to 115200 baud rate.
    b. BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.
12. Integral FIPS 140-2, Level 1 cryptographic module.
13. Supports RESTful API for control of BACnet objects, user management, date and time, and file management.
14. NEMA 1 enclosure with Class 1 and Class 2 separation.
    a. Power Supply Voltage: 120 to 277 V(ac).
15. Automatic algorithm to eliminate redundant, wireless networked paths to streamline communication between the system controller and end devices.

16. System Controller Security Provisions:
    a. Disallow the use of default passwords and require passwords to be updated prior to use.
    b. Support user role-based access, such as administrator, user, and viewer.
    c. Signed firmware to ensure that unmodified, authentic software is always installed.
    d. IP-based communication protected with strong encryption algorithms such as AES or TLS1.2+.
    e. Prevent rollback of firmware to firmware versions with known, critical vulnerabilities.
    f. Valid cybersecurity listing through a third party.
17. Cellular Remote Access: Cellular router and modem for remote access.
    a. Router supports remote access to at least five system controllers on its local area network or network subnet.
    b. Remote access capable of device setting updates, schedule updates, system performance optimization, and diagnostics.
    c. Remote access enabled through outbound communication from router to an outside source. Solutions that begin communication via inbound requests for network access are unacceptable.
    d. Router supports outbound communication to manufacturer-hosted portal using TLS1.2 or greater in-transit encryption over a cellular or Ethernet connection.
    e. Router with integral firewall to prevent unauthorized access to devices connected to its local area network port.
    f. Router includes cellular SIM capable of connection to AT&T, T-Mobile, Sprint, US Cellular, Alaska Wireless, Telefonica, Tellus, Bell, or Sasktel networks where carrier service is available.
    g. Outbound communication from the router limited to whitelisted endpoints. Devices that allow unrestricted communication are unacceptable.
    h. Outbound communication from router includes only lighting control system information.

2.5 WIRED NETWORKED DEVICES

A. Wired Networked Wall Switches, Dimmers, Scene Controllers:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nPODM or comparable product by one of the following:
    a. Cooper Industries, Inc.
    b. Leviton Manufacturing Co., Inc.
2. Mounting: Suitable for installation in single-gang switch box.
3. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
4. All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
5. Devices with mechanical push buttons provide tactile and LED user feedback.
6. Devices with mechanical push buttons manufactured with custom button labeling.
7. Wall switch and dimmer options:
    a. Number of control zones: 1.
    b. Control Types Supported:
        1) On/Off.
        2) On/Off/Dimming.
        3) On/Off/Dimming/Correlated Color Temperature Control for specific luminaire types.

c. Color: White.

8. Scene Controller Options:
   a. Number of Scenes: 1.
   b. Control Types Supported:
      1) On/Off.
      2) On/Off/Dimming.
      3) Preset Level Scene Type.
      4) On/Off/Dimming/Preset Level for Correlated Color Temperature.
      5) Reprogramming of other devices within daisy-chained zone to implement user-selected lighting scene including manual start/stop from the scene controller, or optionally programmed automatic stop after a user-selectable duration between five minutes and 12 hours.
      6) Selecting a lighting profile to be run by device's upstream controller to implement a selected lighting profile across multiple zones including manual start/stop from the scene controller, or optionally programmed automatic stop after a user selectable duration between five minutes and 12 hours.
   c. Color: White.

B. Networked Graphic Wall Stations:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nPOD TOUCH or comparable product by one of the following:
      a. Cooper Industries, Inc.
      b. Leviton Manufacturing Co., Inc.
   2. Mounting: Suitable for installation in single-gang switch box.
   3. Integral 3.5-inch (88 mm) capacitive full-color touch screen.
   4. Power via polarity insensitive Class 2 low-voltage 15 to 24V (dc) power supply.
   5. Device enables mobile application control of control zones and scenes through Bluetooth.
   6. Communication over standard low-voltage network cabling with RJ-45 connectors.
   7. User-customizable screen saver utilizing uploaded image file in common file format including jpg, png, gif, bmp, or tif.
   8. Capable of configuration of all switches, dimmers, control zones, and lighting preset scenes via password-protected setup screens.
   9. Graphic Wall Station Options:
      a. Number of Control Zones: Up to 16.
      b. Number of Scenes: Up to 16.
      c. Profile Scene Duration: User configurable from five minutes to 12 hours.
      d. Color: White.

C. Digital Time Clock:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nDTC or comparable product by one of the following:
      a. Cooper Industries, Inc.
      b. Leviton Manufacturing Co., Inc.
   2. Controls a linear bus of lighting devices suppling all time functions without connection to a system controller.
      a. Programming of the linear bus of lighting devices must not require additional hardware, including computers, specialized dongles, or other connection devices.
      b. Programming of the linear bus exclusively done through the touch-screen interface.

3. Capable of up to 32 schedules. Each schedule consists of one set of On and Off times per day for each day of the week and for each of two holiday lists. Schedules assignable to any individual relay or group of relays.
4. Operates from non-volatile memory so that all system programming is retained indefinitely.
5. Mounted inside a relay panel to eliminate the necessity for additional enclosures for complete installation.
6. Capacitive 3.5-inch (88 mm), full-color touch screen.

D. Wired Networked Occupancy and Photosensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nCM or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Detect the presence of human activity within space and fully control the on/off function of lights.
3. Utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
4. Dual technology sensors used in locations where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions).
5. Dual technology sensors must have one sensing technology not motion dependent to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT), which detects both occupant motion and sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) are unacceptable.
6. All sensing technologies are acoustically passive, meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers and hearing devices). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonic technology. Ultrasonic and Microwave-based sensing technologies are unacceptable.
7. Ceiling, fixture, recessed, and corner mounted sensors available, with multiple lens options available customized for specific applications.
8. Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
9. All sensors detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
10. Sensor programming parameter available and configurable remotely from the software and locally via the device push button.
11. Ceiling mount occupancy sensors include one integrated dry contact switching relay, capable of switching 1 A at 24 V, resistive only.
12. Sensors available with one or two occupancy "poles," each of which provides a programmable time delay.
13. Photosensor/daylight override, automatic dimming control, and low temperature/high humidity operation.
14. Photosensor provide one on/off set-point and include a dead band to prevent the artificial light from cycling. Delay incorporated into the photosensor to prevent rapid response to passing clouds.
15. Photosensor and dimming sensor's set-point and dead band automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-Point Programming"

procedure. Min and max dim settings as well as set-point may be manually entered or modified.

16. Dead band setting verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
17. Dual zone option available for On/Off Photosensor, Automatic Dimming Control Photosensor, or Combination units. The secondary daylight zone capable of being controlled as an "offset" from the primary zone.

E. Wired Networked Wall Switch Sensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nWSX LV or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Mounting: Suitable for installation in single-gang switch box.
3. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
4. All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
5. Devices with mechanical push buttons provide tactile and LED user feedback.
6. Wall Switch Sensor Options:
   a. User Input Control Types: On/Off/Dimming.
   b. Occupancy Sensing Technology: Dual technology acoustic.
   c. Daylight Sensing Option: Inhibit Photosensor.
   d. Color: White.

F. Wired Networked Embedded Fixture Sensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nES or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Network system sensors with occupancy sensors and/or dimming photosensors that can be embedded into luminaire such that only the lens shows on luminaire face.
3. Occupancy sensor detection pattern suitable for 7.5 to 20-ft. (2.2 to 6-m) mounting heights.
4. Embedded Sensor Options:
   a. Occupancy Sensing technology: Dual technology acoustic.
   b. Sensing Option: Combination Occupancy/Daylight sensor.

G. Wired Networked Power Packs:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nPP16 series or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Plenum rated.
3. Communication will be delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
4. Supply Voltage: 120 to 277 V(ac).
5. Relay Output: Class 1 relay rated for 16 A at 277 V(ac) and 1/2 HP at 120 V(ac).
6. Dimming Output: 0-10 VDC Dimming output.

7. Sink Current: 100 mA at 0-10 V(dc).
8. Mounting: Integral 1/2-inch (16-mm) chase nipple. Plastic clips into junction box are unacceptable.

H. Wired Networked Relay and Dimming Panel:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; ARP or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Outputs: 4 Individual relays per panel, with an equal number of individual 0-10 V(dc) dimming outputs.
3. Field Configurable Relays (FCR):
   a. Field configurable to operate in single-, double-, or triple-pole relay groupings.
   b. Field configurable to operate as normally closed or normally open.
   c. Provides visual status of current state and manual override control of each relay.
   d. Minimum Relay Contact Ratings:
      1) 40 A at 120-480 V(ac) Ballast.
      2) 16 A at 120-277 V(ac) Electronic.
      3) 20 A at 120-277 V(ac) Tungsten.
      4) 20 A at 48V (dc) Resistive.
      5) 2 HP at 120 V(ac).
      6) 3 HP at 240-277 V(ac).
      7) 65kA SCCR at 480 V(ac).
4. Dimming Output Rating: Minimum of 100 mA sink current per dimming output.
5. Relay and dimming outputs individually programmable.
6. Listing: UL 924 for control of emergency lighting circuits.
7. Power Supply: Integrated 120-277 V(ac) supply.
8. Low-Voltage Sensor Input:
   a. Configurable to support any of the following input types:
      1) Indoor Photosensor.
      2) Outdoor Photosensor.
      3) Occupancy Sensor.
      4) Contact Closure.
   b. Low-voltage sensor input provides 24 V(dc) power for sensor so additional auxiliary power supplies are not required.
   c. Sensor input supports all standard sequence of operations.
9. Integrated Digital Time Clock for local schedule control.
10. Contact Closure Input: One for each group of eight output relays that acts as a panel override to activate the normally configured state of all associated relays (i.e., normally open or normally closed).
11. Panel supplies current limited low-voltage power to other networked devices connected via low-voltage network cable.
12. Enclosure:
    a. Enclosure Rating: NEMA 1.
    b. Mounting: Surface mounted.
    c. Cover: Hinged cover with keyed lock.

I. Wired Networked Bluetooth Low-Energy Programming Device:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nIO BT or comparable product by one of the following:
   a. Cooper Industries, Inc.

b. Leviton Manufacturing Co., Inc.

2. Plenum rated, inline wired, and screw mountable.
3. Communication and low-voltage power delivered to device via standard low-voltage network cabling with RJ-45 connectors.
4. Bluetooth communication allows connection from smartphone application for programming device settings within the local daisy-chain zone.
5. Device provides visual indication of remote Bluetooth connection via LED integrated into device enclosure such that it is visible from all angles while the zone is being programmed.

J. Wired Networked Communication Bridge:

1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nBRG or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Suitable for surface mount to a standard 4 by 4-inch (100 by 100 mm) square junction box.
3. Communication Ports: Eight RJ-45 ports for connection to lighting control zones (up to 128 devices per port), additional network bridges, and System Controller.
4. Capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to System Controller.
5. Power Input: Class 2 low-voltage supplied locally via a directly wired power supply.
6. Wired Bridge capable of redistributing power from its local supply and connected lighting control zones with excess power to lighting control zones with insufficient local power. Architecture enables loss of power to a particular area to be less impactful on network lighting control system.

2.6 WIRELESS NETWORKED DEVICES

A. Wireless Networked Wall Switches, Dimmers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rPOD series or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Mounting: Suitable for installation in single-gang switch box.
3. Wireless Communication:
   1) Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
   2) Security: AES-128 bit.
4. Power Supply: 120 to 277 V(ac) Battery powered with 10 year minimum expected battery life.
5. Mechanical push buttons provide tactile and LED user feedback during button press.
6. Mechanical push buttons available with custom button labeling.
7. Wall Switches and Dimmer Options:
   a. Number of Control Zones: 1.
   b. Control Types Supported: On/Off and On/Off/Dimming.
8. Scene Switch Options:
   a. Number of Scenes: 2.
   b. Control Types Supported: On/Off, On/Off/Dimming, and Preset Level Scene Type.
9. Color: White.

B. Wireless Networked Embedded Fixture Control Devices:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rIO or comparable product by one of the following:
      a. Cooper Industries, Inc.
      b. Leviton Manufacturing Co., Inc.
   2. Wireless Communication:
      a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
      b. Security: AES-128 bit.
   3. Power Supply: Standard low-voltage wiring typically associated with an LED driver.
   4. Suitable for installation within a luminaire such that the control device is not visible on the luminaire face.
   5. Devices available with integrated and remote antennas such that devices can be installed within sealed container without detriment to wireless strength.
   6. Antenna Color: White.
   7. Dimming Output: 0-10V.
   8. Power loss detection, where unit powers and controls the emergency circuit. Loss of wireless broadcasts from a dedicated normal-power-connected device forces unit to shunt closed, go to full bright, and ignore all system commands until main power is restored.

C. Wireless Networked Indoor Load Controllers with Occupancy and Photosensors:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rLSXR or comparable product by one of the following:
      a. Cooper Industries, Inc.
      b. Leviton Manufacturing Co., Inc.
   2. Wireless Communication:
      a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
      b. Security: AES-128 bit.
   3. Detect the presence of human activity within space and fully control the on/off function of lights.
   4. Utilizes passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
   5. Dual technology sensors used in locations where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions).
   6. Dual technology sensors must have one sensing technology not motion dependent to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT), which detects both occupant motion and sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) are unacceptable.
   7. All sensing technologies are acoustically passive, meaning they do not transmit sound waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers and hearing devices). Acceptable detection technologies include Passive Infrared (PIR) and/or Microphonic technology. Ultrasonic and Microwave-based sensing technologies are unacceptable.
   8. Sensor programming parameters available and configurable remotely.
   9. Ceiling, fixture, and junction box mounted sensors available, with multiple lens options available customized for specific applications.
   10. Integral daylight photosensor for programmable daylight harvesting.
   11. Photosensor includes adjustable illumination set-point and dead band to prevent the artificial light from cycling. Set-point and dead band capable of automatically calibrating

through an "Automatic Set-Point Programming" procedure. Min and max dimming settings and set-point may be manually entered or modified.

12. Dead band setting verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
13. Power loss detection, where unit powers and controls the emergency circuit. Loss of wireless broadcasts from a dedicated normal-power-connected device forces unit to shunt closed, go to full bright, and ignore all system commands until main power is restored.
14. Power Monitoring: Integral current measurements on output with 3 percent accuracy when measuring loads 225 mA or greater.

D. Wireless Networked Indoor Occupancy and Photosensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rCMS or comparable product by one of the following:
    a. Cooper Industries, Inc.
    b. Leviton Manufacturing Co., Inc.
2. Wireless Communication:
    a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
    b. Security: AES-128 bit.
3. Detect the presence of human activity within space and fully control the on/off function of lights.
4. Utilizes passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
5. Dual technology sensors used in locations where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions).
6. Dual technology sensors must have one sensing technology not motion dependent to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT), which detects both occupant motion and sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) are unacceptable.
7. All sensing technologies acoustically passive, meaning they do not transmit sound waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers and hearing devices). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonic technology. Ultrasonic and Microwave-based sensing technologies are unacceptable.
8. Sensor programming parameters available and configurable remotely.
9. Ceiling, fixture, and junction box mounted sensors available, with multiple lens options available customized for specific applications.
10. Dry Contact Output: One integrated dry contact switching relay, capable of switching 100 mA at 24 V, resistive only.
11. Integral daylight photosensor for programmable daylight harvesting.
12. Photosensor includes adjustable illumination set-point and dead band to prevent the artificial light from cycling. Set-point and dead band capable of automatically calibrating through an "Automatic Set-Point Programming" procedure. Min and max dimming settings and set-point may be manually entered or modified.
13. Dead band setting verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

E. Wireless Networked Outdoor Occupancy and Photosensors:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rSDGR or comparable product by one of the following:
      a. Cooper Industries, Inc.
      b. Leviton Manufacturing Co., Inc.
   2. Wireless Communication:
      a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
      b. Security: AES-128 bit.
   3. Mounting: Nipple mount with IP66 rating.
   4. Supply Voltage: 120 to 277 V(ac).
   5. Detect the presence of human activity within space and fully control the on/off function of lights.
   6. Utilizes passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
   7. Sensors detect valid communication and blink a unique LED pattern to visually indicate a potential issue.
   8. Sensor programming parameters available and configurable remotely.
   9. Available with multiple lens options available for various mounting heights.
   10. Power Monitoring: Integral current measurements on output with 3 percent accuracy when measuring loads 225 mA or greater.
   11. Integral daylight photosensor for programmable daylight harvesting.
   12. Photosensor includes adjustable illumination set-point and dead band to prevent the artificial light from cycling. Set-point and dead band capable of automatically calibrating through an "Automatic Set-Point Programming" procedure. Min and max dimming settings and set-point may be manually entered or modified.
   13. Dead band setting verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
   14. Power loss detection, where unit powers and controls the emergency circuit. Loss of wireless broadcasts from a dedicated normal-power-connected device forces unit to shunt closed, go to full bright, and ignore all system commands until main power is restored.

F. Wireless Networked Indoor Embedded Sensors:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rES7 or comparable product by one of the following:
      a. Cooper Industries, Inc.
      b. Leviton Manufacturing Co., Inc.
   2. Wireless Communication:
      a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
      b. Security: AES-128 bit.
   3. Sensors consisting of occupancy sensors and dimming photosensor suitable for installation within a luminaire such that only the lens is visible on luminaire face.
   4. Power Supply: Standard low-voltage wiring typically associated with an LED driver.
   5. Devices available with integrated and remote antennas such that devices can be installed within sealed container without detriment to wireless strength.
   6. Antenna Color: White.
   7. Dimming Output: 0-10 V.
   8. Detect the presence of human activity within space and fully control the on/off function of lights.

9. Utilizes passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
10. Sensors detect valid communication and blink a unique LED pattern to visually indicate a potential issue.
11. Sensor programming parameters available and configurable remotely.
12. Available with multiple lens options available for various mounting heights.
13. Integral daylight photosensor for programmable daylight harvesting.
14. Photosensor includes adjustable illumination set-point and dead band to prevent artificial light from cycling. Set-point and dead band capable of automatically calibrating through an "Automatic Set-Point Programming" procedure. Min and max dimming settings and set-point may be manually entered or modified.
15. Dead band setting verified and modified by sensor automatically every time lights cycle to accommodate physical changes in space (i.e., furniture layouts, lamp depreciation, or lamp outages).
16. Power loss detection, where unit powers and controls the emergency circuit. Loss of wireless broadcasts from a dedicated normal-power-connected device forces unit to shunt closed, go to full bright, and ignore all system commands until main power is restored.

G. Wireless Networked Outdoor Embedded Sensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rMSOD or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Wireless Communication:
   a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
   b. Security: AES-128 bit.
3. Sensors consisting of occupancy sensors and dimming photosensor suitable for installation within a luminaire such that only the lens is visible on luminaire face.
4. Power Supply: Standard low-voltage wiring typically associated with an LED driver.
5. Color: White.
6. Ingress Protection: Minimum IP66.
7. Devices available with remote antennas such that devices can be installed within sealed container without detriment to wireless strength.
8. Detect the presence of human activity within space and fully control the on/off function of lights.
9. Utilizes passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
10. Sensors detect valid communication and blink a unique LED pattern to visually indicate a potential issue.
11. Sensor programming parameters available and configurable remotely.
12. Available with multiple lens options available for various mounting heights.
13. Integral daylight photosensor for programmable daylight harvesting.
14. Photosensor includes adjustable illumination set-point and dead band to prevent artificial light from cycling. Set-point and dead band capable of automatically calibrating through an "Automatic Set-Point Programming" procedure. Min and max dimming settings and set-point may be manually entered or modified.
15. Dead band setting verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

16. Power loss detection, where unit powers and controls the emergency circuit. Loss of wireless broadcasts from a dedicated normal-power-connected device forces unit to shunt closed, go to full bright, and ignore all system commands until main power is restored.

H. Wireless Networked Power Packs:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; rPP series or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Wireless Communication:
   a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.
   b. Security: AES-128 bit.
3. Plenum rated.
4. Supply Voltage: 120 to 277 V(ac).
5. Relay Output: Class 1 relay rated for 20 A and 1.5 HP at 120 to 277 V(ac) and 5 A and 0.5 HP at 480 V(ac).
6. Dimming Output: 0-10 V(dc).
7. Sink Current: 150 mA at 0-10 V(dc).
8. Antenna Type: Integrated.
9. Programming parameters available and configurable remotely.
10. Mounting: Integral 1/2-inch (16-mm) chase nipple. Plastic clips into junction box are unacceptable.
11. Power Packs Options:
   a. Power Pack capable of full 20-Amp switching of all normal power lighting load types, with optional 0-10V dimming output capable of up to 150 mA of sink current.
   b. Power Packs capable of full 20-Amp switching of general purpose receptacle (plug-load) control.
   c. Listing: UL 924 for control of emergency lighting circuits, field configurable for two distinct sequence of operation:
      1) Power sense of normal power feed, where unit powers and controls emergency circuit, and loss of the normal power sense circuit forces the power pack to shunt closed, go to full bright, and ignore all system commands until normal power is restored.
      2) Power loss detection, where unit powers and controls the emergency circuit. Loss of wireless broadcasts from a dedicated normal-power-connected device forces unit to shunt closed, go to full bright, and ignore all system commands until main power is restored.
   d. Power Monitoring: Integral current measurements on output with 3 percent accuracy when measuring loads 625 mA or greater.
   e. Chicago Plenum External Antenna:
      1) Mounting: 1/2-inch (16-mm).
      2) Ingress Protection: IP67.

I. Wireless Networked Communication Adapter:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nECYD or comparable product by one of the following:
   a. Cooper Industries, Inc.
   b. Leviton Manufacturing Co., Inc.
2. Wireless Communication:
   a. Dual 900 MHz IEEE 802.15.4 based and 2.4 GHz, Version 4.0+ Bluetooth.

b. Security: AES-128 bit.

3. Capable of supporting a minimum of 750 networked wireless devices per adapter.
4. Interface: USB connection.
5. Ingress Protection: Minimum IP66.
6. Mounting: Integral 1/2-inch (16-mm) chase nipple. Minimum 16 ft. (4.8 m) USB cable and optional cable extenders for remote mounting.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING

A. Wiring Method: Comply with Division 26 Section "Conductors and Cables". Minimum conduit size is 1/2 inch (13 mm).
   1. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes".

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling, boxes, cabinets, and terminals. Comply with identification requirements specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with Division 26 Section "Basic Electrical Materials and Methods."

C. Identify all controls with device address.

D. Label each device cable within 6 inch (152 mm) of connection to bus power supply or termination block.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test continuity of each circuit.

B. Tests and Inspections: Perform test inspections.
   1. Test each zone using local and remote control hardware.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.

C. Nonconforming Work:
   1. Lighting controls will be considered defective if they do not pass tests and inspections.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Field Test Reports: Prepare field test reports.

1. Prepare functionality and inspection reports, including a certified report that identifies controls included and describes test results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.
2. Include list of all points created from actual tests of all addressed control points for lamps, ballasts, manual controls, and sensors.

3.4 REMOTE ACCESS

A. Digital network lighting control system capable of remote access by manufacturer with the following features:
   1. System diagnostics including detection of fault condition in hardware or connected devices.
   2. Access to all connected devices for complete programming including scheduling of time-of-day events and device parameters necessary to meet required sequence of operations.
   3. Browser-based interface to verify system functionality.
   4. On-demand access to manufacturer technical support for remote troubleshooting, diagnostics, configuration, and programming.
   5. Owner training on the digital network lighting control system available remotely.

B. Remote access system fully functional over commercial celluar connection or Internet-connected ethernet network.

C. All hardware associated with remote access including cellular modem and cellular antenna are to remain on-site regardless of warranty or cellular contract status.

3.5 SYSTEM STARTUP

A. Perform startup service.
   1. Complete installation and startup checks in accordance with manufacturer's published instructions.
   2. Activate luminaires and verify that all maximum output levels match output levels detailed in an Owner-approved sequence of operations.
   3. Confirm correct communications wiring, initiate communications between control devices and controller/gateways, and program the lighting control system in accordance with approved configuration schedules, time-of-day schedules, and input override assignments.
   4. Program network devices to meet required sequence of operations.
   5. Program and verify all sequence of operations.
   6. Create backup of system programming.
   7. Assist in installation of system software on customer-provided workstation or server.
   8. Verify bidirectional communication of manufacturer-provided cellular router with manufacturer-managed remote access portal.

B. Commissioning Walkthrough: Per form to demonstrate lighting control system functionality and verify the system meets the specified Project requirements.

3.6 CLOSEOUT ACTIVITIES

A. Enhanced Documentation: Engage lighting system manufacturer to provide comprehensive system documentation including detailed programming, sequence of operation data per Project specifications, and related code requirements.

B. Training: Engage lighting system manufacturer to provide comprehensive system overview, software overview, and documentation relating to system operation and maintenance.

3.7 PROTECTION

A. After installation, protect digital network lighting controls from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.8 MAINTENANCE

A. Engage a factory-authorized service representative to perform on-site system adjustments.
   1. On-Site Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site settings adjustments to suit actual occupied conditions. Provide up to one visits to Project during other-than-normal occupancy hours for this purpose.
   2. Prepare and submit report after each visit that details activities performed.

B. Engage a factory-authorized service representative to perform remote system adjustments.
   1. Remote Occupancy Adjustments: When requested within 12 months from date of Substantial Completion and project registration with lighting control system manufacturer, provide remote settings adjustments to suit actual occupied conditions. Provide up to one sessions to Project during other-than-normal occupancy hours for this purpose.
      a. System to include manufacturer-provided cellular communication hardware and connection to the system for a minimum of 12 months after substantial completion to allow for factory representative assistance with settings adjustments and system sustainment.
      b. For the remaining duration of the maintenance term, or in the event cellular connectivity is not available, manufacturer assistance must be available through an Owner-provided, Internet-connected network.
   2. Prepare and submit report after each session that details activities performed.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Lighting and appliance branch-circuit panelboards.
2. Transient voltage suppression panelboards.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, 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. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panelboard Schedules: For installation in panelboards.

F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Division 1 Section "Material and Equipment."

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 NEMA PB 1.

E. Comply with NFPA 70 (2020).

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 degrees F (40 degrees C).
2. Altitude: Not exceeding 6600 feet (2000 meters).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 meters).

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 Owner no fewer than seven days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Owner's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Work."

B. Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.
b. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions.
3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Mechanical type.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.2 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Products: Subject to compliance with requirements, provide one of the products specified.

1. Cutler-Hammer: PRL1a (208/120V).
2. General Electric: AQ Series (120/120V).
3. Siemens: Sentron S1 (120/120V).
4. Square-D: NQOD (120/120V).

B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

C. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 TRANSIENT VOLTAGE SUPPRESSION PANELBOARDS

A. Manufacturers: Products: Subject to compliance with requirements, provide one of the products specified.

1. Cutler-Hammer: As specified above with integral "Clipper" TVSS
2. General Electric: As specified above with integral "ME" TVSS.
3. Siemens: As specified above with integral "TPS" TVSS.
4. Square-D: As specified above with integral "Surge Logic" TVSS.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

C. Main Overcurrent Devices: Thermal-magnetic circuit breaker.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

E. Bus: Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.

F. Transient Voltage Suppression Device: IEEE C62.41, integrally mounted, plug-in-style, solid-state, parallel-connected, sine-wave tracking suppression and filtering modules.

1. Minimum Single-Impulse Current Ratings:

a. Line to Neutral: 100,000 A.
b. Line to Ground: 100,000 A.
c. Neutral to Ground: 50,000 A.

2. Protection modes shall be as follows:

    a. Line to neutral.
    b. Line to ground.
    c. Neutral to ground.

3. EMI/RFI Noise Attenuation Using 50-ohm Insertion Loss Test: 55 dB at 100 kHz.
4. Maximum UL 1449 Clamping Levels: 400 V, line to neutral and line to ground on 120/208 V systems.
5. Withstand Capabilities: 3000 Category C surges with less than 5 percent change in clamping voltage.
6. Accessories:

    a. Form-C contacts, one normally open and one normally closed, for remote monitoring of system operation. Contacts to reverse position on failure of any surge diversion module.
    b. Audible alarm activated on failure of any surge diversion module.
    c. Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Full module, inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Tandem or "piggyback" breakers are not acceptable.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box.

D. Install overcurrent protective devices and controllers.

E. Install filler plates in unused spaces.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Create a directory to indicate installed circuit loads. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section, "Grounding and Bonding."

B. Connect wiring according to Division 26 Section, "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Duplex receptacles.
2. Single receptacles.
3. Ground-fault circuit interrupters.
4. Single- pole switches.
5. Three way switches.
6. Double-pole switches.
7. Dimmer switches.
8. Device wall plates.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. TVSS: Transient voltage surge suppressor.

C. EMI: Electromagnetic interference.

D. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70 (2020).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following (for each type of wiring device):

1. Single Pole Toggle Switch, 120-277V, 20A:

    a. Hubbell #HBL1221.
    b. Leviton #1221-2.
    c. P & S #20-AC-1.

2. Two Pole Toggle Switch, 120-277V, 20A:

    a. Hubbell #HBL1222.
    b. Leviton #1222-2.
    c. P & S #20-AC-2.

3. Three-Way Toggle Switch, 120-277V, 20A:

    a. Hubbell #HBL1223.
    b. Leviton #1223-2.
    c. P & S #20-AC-3.

4. Four-Way Toggle Switch, 120-277V, 20A:

    a. Hubbell #HBL1224.
    b. Leviton #1224-2.
    c. P & S #20-AC-4.

5. Duplex Receptacle, 125V-1ϕ-20A:

    a. Hubbell #HBL5362.
    b. Leviton #5362.
    c. P & S #5362A.

6. GFCI Receptacles, 125V-1ϕ-20A:

    a. Hubbell #HBL-GF-5362.
    b. Leviton #8899.
    c. P & S #2091-S.

7. Motor Rated Switches and Manual Motor Starters:

    a. General Electric CR101 Series.
    b. Square-D FG or KG Series.
    c. P & S 78XX Series.

2.2 DEVICE PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel. Material for Unfinished Spaces: Galvanized steel.
3. Material for Wet Locations: Thermoplastic, with spring-loaded lift cover, and listed and labeled for use in "wet locations." For receptacles, listing shall apply with plug cap inserted.

2.3 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies, level, plumb, and square with building lines.

B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions. Where switches are mounted adjacent to dimmers, switch shall be that dimmer manufacturer's companion device, matching dimmer style.

C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates. Provide dimmer manufacturer's custom companion plates where dimmers and switches are mounted together.

E. Remove wall plates and protect devices and assemblies during painting.

3.2 MOUNTING HEIGHTS

A. Mount toggle switches at 48 inches above finished floor to center of toggle handle.

B. Mount receptacles, telephone outlets and data outlets 18 inches above finished floor to center of receptacle unless specifically noted otherwise.

C. Mount devices above counters at 2 inches from bottom of device to top of counter, or counter backsplash.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Basic Electrical Materials and Methods".

1. Receptacles: Identify panelboard and circuit number from which served. 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 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

D. Do not connect stranded wire to devices using back wired push-in feature.

E. When terminating stranded conductors on devices, ends of strands shall be contained by insulation so that all strands must be held by screw.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the cartridge fuses rated 600 V and less for use in switches.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 1, include the following:

a. Let-through current curves for fuses with current-limiting characteristics.
b. Time-current curves, coordination charts and tables, and related data.
c. Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70 (2020).

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 degrees F (5 degrees C) or more than 100 degrees F (38 degrees C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Quantity equal to one complete set of each type and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc.
2. Ferraz Shawmut, Inc.
3. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Service Entrance: Class J, fast acting.

B. Motor Branch Circuits: Dual element, time delay, current limiting, Class RK5.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION

SECTION 26 28 16 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes individually mounted enclosed switches used for the following:

1. Service disconnecting means.
2. Manual transfer switch with integral cam locks.
3. Motor and equipment disconnecting means.

B. Related Sections include the following:

1. Division 26 Section "Fuses," for overcurrent protective devices installed in switches.

1.3 DEFINITIONS

A. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switch, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Field Test Reports: Submit written test reports and include the following:

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.

C. Maintenance Data: For enclosed switches and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:

1. Routine maintenance requirements for components.
2. Manufacturer's written instructions for testing and adjusting switches.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA AB 1 and NEMA KS 1.

C. Comply with NFPA 70 (2020).

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 degrees F (minus 30 degrees C) and not exceeding 104 degrees F (40 degrees C).
2. Altitude: Not exceeding 6600 feet (2000 meters).

1.7 COORDINATION

A. Coordinate layout and installation of switches and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fusible Switches:

a. Eaton Corp.; Cutler-Hammer Products. DH Series
b. General Electric Co.; Electrical Distribution & Control Division. Type "TH"
c. Siemens Energy & Automation, Inc. "H" Series
d. Square D Co. "H" Series

2.2 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Double 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.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Receptacles: Cam-lock suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested enclosures before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches for compliance with installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

B. Switches shall be mounted so that operating handle is up when switch is on and down when it is off.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws. Indicate load designation.

3.4 CONNECTIONS

A. Install equipment grounding connections for switches with ground continuity to main electrical ground bus.

B. Connect lightning arresters.

C. Install power wiring. Install wiring between switches and equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch and component.
2. Test continuity of each line- and load-side circuit.

B. Testing: After installing enclosed switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5. 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.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16

SECTION 26 32 13 - PACKAGED ENGINE GENERATOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes packaged engine-generator sets for emergency standby power supply with the following features:

1. Natural gas engine.
2. Gaseous fuel system.
3. Control and monitoring
4. Generator overcurrent and fault protection
5. Generator, exciter, and voltage regulator.
6. Vibration isolation devices.

B. Related Sections include the following:

1. Division 26 Section "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.

1.4 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.
3. Color chips for selection of finish color for generator enclosure.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
3. Report of sound generation.
4. Report of exhaust emissions showing compliance with applicable regulations.
5. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

D. Field quality-control test reports.

1. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

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. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from not necessarily the same manufacturer, but as a part of the equipment furnished with the generator.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70 (2020).

H. Comply with NFPA 99.

I. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. 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.

1.6 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 Engineer no fewer than fourteen days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Engineer’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: 5 to 40 deg C.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet (300 m).

1.7 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 in Division 3.

B. Coordinate size and location of roof curbs, equipment supports, and roof penetrations for remote radiators. These items are specified in Division 7 Section "Roof Accessories."

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Initial 1-Year Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Generac Power Systems, Inc.
2. Onan/Cummins Power Generation; Industrial Business Group.
3. MTU Onsite Energy

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, with capacity as required to operate as a unit as evidenced by records of prototype testing.
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 GAS ENGINE

A. Fuel: Natural Gas.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

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. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible 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. Silencers mounted inside the generator main compartment shall be wrapped in thermal insulation to minimize heat stress on the surrounding components.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 10 feet (3 m) 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: 12-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: Lead acid with 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 Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. 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 GAS FUEL SYSTEM

A. Natural Gas Piping: Comply with requirements in Section 23 11 23 “Facility Natural Gas Piping.”

B. Gas Train: Comply with NFPA 37.

C. Engine Fuel System:

D. Natural Gas

1. Carburetor.
2. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.
3. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; on for each fuel source
4. Fuel Filters: One for each fuel type.
5. Manual Fuel Shutoff Valves: One for each fuel type.
6. Flexible Fuel Connectors: Minimum one for each fuel Connection.
7. LP gas flow adjusting valve.
8. Fuel change gas pressure switch.

2.5 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.

D. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

E. Comply with UL 508A.

F. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter AC ammeter.
2. AC KW/KVA/PF meter.
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.

G. 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.

H. 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.

I. 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.

J. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

1. Engine high-temperature shutdown.
2. Lube-oil, low-pressure shutdown.
3. Overspeed shutdown.
4. Remote emergency-stop shutdown.
5. Engine high-temperature prealarm.
6. Lube-oil, low-pressure prealarm.
7. Fuel tank, low-fuel level.
8. Low coolant level.

K. Load Shedding: Provide controls to perform load shedding and load restoration using one of the automatic transfer switches as described on the drawings.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated where scheduled; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.7 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. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

J. Subtransient Reactance: 12 percent, maximum.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, Level 1 sound-attenuating housing, wind resistant up to 100 mph (160 km/h). 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. Description: Prefabricated or preengineered enclosure with the following features:

1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.
2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
3. Space Heater: Thermostatically controlled and sized to prevent condensation.
4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
5. Hinged Doors: With padlocking provisions.
6. Receptacle: 120V convenience outlet mounted inside enclosure.
7. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
8. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
9. Muffler Location: External to enclosure.
10. Ladders bolted to enclosure to allow quick access to the controller and to the output circuit breakers.

C. 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.

2.9 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.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: One of the manufacturer's standard finishes over corrosion-resistant pretreatment and compatible primer.

2.11 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.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Mechanical Division 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. Ground equipment according to Division 26 Section "Grounding and Bonding."

D. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 IDENTIFICATION

A. Identify system components according to Division 23 Section "Mechanical Identification" and Division 26 Section "Basic Electrical Materials and Methods."

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection (except those indicated to be optional) for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. A load bank test shall be performed by the supplier for a minimum of 4 hours loads from one hour at 25%, one hour at 50%, and two hours at 100%. Readings shall be recorded every 15 minutes to engine and generator parameters.
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. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

E. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

F. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

G. Remove and replace malfunctioning units and retest as specified above.

H. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

I. 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.

J. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 26 32 13

SECTION 26 36 00 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Remote annunciation systems.

B. Related Sections include the following:

1. Division 26, “Packaged Engine Generator.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, power sources, and load.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Qualification Data: For manufacturer.

D. Field quality-control test reports.

1. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches through same source as emergency generator; not necessarily by the same manufacturers as the generator, but as a part of the equipment furnished with the generator.

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 NEMA ICS 1.

E. Comply with NFPA 70 (2020).

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

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:

1. Notify Engineer no fewer than fourteen days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Engineer’s written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Transfer Switches:

a. Caterpillar; Engine Div.
b. Generac Power Systems, Inc.
c. Onan/Cummins Power Generation; Industrial Business Group.
d. ASCO
e. MTU Onsite Energy

f. Eaton
g. GE/Zenith

2.2 GENERAL AUTOMATIC TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. 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.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. 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.

D. 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.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. 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.

G. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

H. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

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 Division 16 Section "Electrical Identification."

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. The time-delays, drop-out and pick-up levels for the transfer switch controls shall be adjustable by hand in the field without the use of a computer or electronic programming device.

K. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 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. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

G. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

H. Service Entrance Rated 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: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. 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.
13. 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 REMOTE ANNUNCIATOR SYSTEM

A. Remote 20-Point Alarm Annunciator: Comply with NFPA 99 and provide additional alarm points as indicated on drawings. 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. If 20-point annunciator is not a standard product, provide one or more annunciators for a total of 20 alarm points minimum.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.5 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. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details.

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

C. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

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.
2. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. 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.

5. 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. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. 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. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test 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. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
g. 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.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. 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.

E. Remove and replace malfunctioning units and retest as specified above.

F. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 1 Section "Demonstration and Training."

B. Coordinate this training with that for generator equipment.

END OF SECTION 23 36 00

SECTION 26 43 13 -SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes service entrance surge protective device and surge protective device at exterior HVAC equipment containing hermetic compressors.

B. Related Sections include Division 26 Section, "Panelboards," for factory-installed TVSSs.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. SVR: Suppressed voltage rating.

C. TVSS: Transient voltage surge suppressor.

D. SPD: Surge Protective Devices (SPD's).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.

B. Product Certificates: For SPD's, signed by product manufacturer certifying compliance with the following standards:

1. UL 1283.
2. UL 1449.

C. Operation and Maintenance Data: For SPD's to include in emergency, operation, and maintenance manuals.

D. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain SPD's and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of SPD's and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

E. Comply with NFPA 70 (2020).

1.6 PROJECT CONDITIONS

A. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 degrees F (0 to 50 degrees C).
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet (6090 meters) above sea level.

1.7 COORDINATION

A. Coordinate location of SPD's to allow adequate clearances for maintenance.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within one year from date of Final Inspection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the specified.

2.2 SURGE PROTECTIVE DEVICES

A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:

1. LED indicator lights for power and protection status.

2. Knockout mounted.

B. Peak Single-Impulse Surge Current Rating: 20 kA per phase.

C. Connection Means: Permanently wired.

D. Manufacturers:

1. 120/208V, three phase

a. Cutler Hammer 2-CHSA01
b. General Electric 2-9L15FCB001
c. Joslyn 1455-21
d. Square-D 2-SDSA1175

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

A. Install devices at service entrance on line side, with ground lead bonded to service entrance ground.

B. Install devices at each exterior item of mechanical equipment having a hermetic compressor. Connect on line side of local disconnect, with ground lead bonded to branch circuit ground.

C. Make arrester leads as short as possible and keep radius of bends in wire as large as is practical.

3.2 PLACING SYSTEM INTO SERVICE

A. Do not energize or connect service entrance or HVAC equipment to their sources until SPD's are installed and connected.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field tests and inspections and prepare test reports:

1. After installing surge protection devices, but before electrical circuitry has been energized, test for compliance with requirements.
2. Complete startup checks according to manufacturer's written instructions.
3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.

B. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to maintain SPD’s. Refer to Division 1.

END OF SECTION

SECTIOIN 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures with LED arrays and drivers.
2. Lighting fixtures mounted on exterior building surfaces.
3. Emergency lighting units.
4. Exit signs.
5. Accessories.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices," for manual wall-box dimmers for incandescent lamps.
2. Division 26 Section "Lighting Control Devices," for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

B. Correlated Color Temperature (CCT) – a visible light characteristic of comparing a light source to a theoretical, heating black body radiator (measured in degrees kelvin).

C. CRI: Color rendering index.

D. CU: Coefficient of utilization.

E. Effective Projected Area (EPA) – the wind loading of the fixture.

F. International Protection (IP) Rating – delineates the level at which foreign objects and water can intrude inside a device.

G. Restriction of Hazardous Substances (RoHS) – products that are RoHS-compliant do not contain any of the following materials: lead (Pb), mercury (Hg), cadmium (Cd), hexavalent

H. Useful Life – the operating hours before reaching 70% of the initial rated lumen output point with no catastrophic failures under normal conditions.

I. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

J. RCR: Room cavity ratio.

K. Fixture Whip: Flexible wiring as specified from box to individual lighting fixture.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of fixture, including dimensions and verification of indicated parameters.
2. Emergency lighting unit battery and charger.
3. Fluorescent and high-intensity-discharge ballasts.
4. Lamps.

B. Wiring Diagrams: Power, signal, and control wiring.

C. IESNA LM-79 report on manufacturer's standard production model luminaire to include:

1. Testing agency, report number, date, manufacturer's name, catalog number, LED driver, drive current, ambient temperature.
2. Luminaire efficacy (lumens/watt), minimum light output, zonal lumen density.
3. Color qualities (CCT, CRI, chromaticity).
4. ANSI C78.377 Duv.
5. Electrical measurements (input voltage, input current, input power).
6. Spectral distribution over visible wavelengths (mW/nm).
7. Absolute intensity candlepower (cd) summary table.
8. Isocandela plot
9. Photometric file, including BUG rating.

D. IESNA LM-80 report on LED package, array, or module, to include:

1. Testing agency, report number, date, type of equipment, and LED light source being tested.
2. All data required by IESNA LM-80.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, include the following:

1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.

G. Warranties: Special warranties specified in this Section.

1.5 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 1910.7.

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 NFPA 70 (2020).

E. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.6 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.

1.7 WARRANTY

A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period: five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining four years.

B. SPECIAL WARRANTY FOR LED LUMINAIRES

1. The LED manufacturer shall provide a written five-year on-site replacement “finish” warranty for luminaires. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
2. The LED manufacturer shall provide a written five-year on-site replacement warranty for defective or non-starting power supply units and LED source assemblies, which include, but are not limited to, LED packages, LED arrays, LED modules, LED dies, encapsulates, and phosphors.

3. The LED manufacturer shall provide a written five-year on-site replacement warranty for any LED source assembly, package, array, or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array, or module failing to illuminate.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. As specified on the drawings or with approval prior to the bid. Approval granted prior to bid is subject, after the bid, to comparison with the specified equipment and to compliance with the plans, specifications and space limitation requirements.

2.2 FIXTURES AND COMPONENTS, GENERAL

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A. Provide luminaires complete with LED light source and power supply unit. Details, shapes, and dimensions are indicative of the general type desired but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar design, light distribution and brightness characteristics, and of equal finish and quality will be acceptable.

1. Luminaries shall produce a minimum efficacy of 100 lumens per watt.
2. Luminaires shall incorporate modular electrical connections and be constructed to allow replacement of all or part of the optics, heat sinks, power supply units, and electrical components using only a simple tool, such as a screw driver.
3. Luminaires shall bear a nameplate inscribed with the manufacturer's name, address, model number, date of manufacture, and serial number, securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.
4. Luminaires surge protection to meet "C low" waveforms as defined in ANSI/IEEE C62.41.2, scenario 1 Location C.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

E. 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.

F. 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.

4. Laminated Silver Metallized Film: 90 percent.

G. Plastic Diffusers, Covers, 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: At least 0.125 inch (3.175 mm) minimum unless different thickness is scheduled.
b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

H. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461D. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 LIGHTING FIXTURES

A. Fixtures: As scheduled on the Contract Drawings.

1. Suspended fixtures shall be balanced to hang straight and level.
2. Continuous rows of fixtures shall be run straight and level; fixture design shall not be susceptible to misalignment after incidental contact.

2.4 LED POWER SUPPLY UNITS

A. Efficiency: 85%.

B. Maximum drive current: 525 mA.

C. Operating temperature: -30°C to +40°C.

D. Operating voltage: 120V to 277V nominal. Fluctuations in line voltage up to 15% shall have no visible effect on the luminous output.

E. Operating frequency: 50/60 Hz.

F. Power factor (PF) $\geq$ 0.90.

G. Total current harmonic distortion (THD) for current: $\leq$ 20%.

H. Comply with FCC 47 CFR Section 15, Class B, non-consumer RFI/EMI standards.

I. Reduction of hazardous substances- (RoHS-) compliant.

J. Luminaires under a covered structure shall be UL-listed Class P with a sound rating of “A.”

K. Driver shall be dimmable and compatible with a standard dimming control circuits.

L. Driver shall be protected against damage due to either an open-circuit or short-circuit fault condition on the driver output. The driver shall resume normal operation when the fault is removed.

M. Over-temperature protection shall be provided to cut off output power if temperature limit is exceeded. The driver shall resume normal operation when within normal operating temperature.

2.5 LED LIGHT SOURCE

A. Correlated color temperature (CCT) shall be in accordance with ANSI C78.377.

1. Nominal CCT: 3000 K: 3045 $\pm$ 175 K.
2. Nominal CCT: 4000 K: 3985 $\pm$ 275 K
3. Nominal CCT: 5000 K: 5028 $\pm$ 283 K.
4. Nominal CCT: 6500 K: 6530 $\pm$ 510 K.

B. Color Rendering Index (CRI) shall be:

1. $\geq$ 80 for 3000 K – 3500 K
2. $\geq$ 70 for 4000 K – 6500 K

C. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

2.6 EXIT SIGNS

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. 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.

2.7 LED EMERGENCY LIGHTING FIXTURES

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.

1. Emergency Connection: Operate at reduced rating. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
3. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
4. Charger: Fully automatic, solid-state, constant-current type.

2.8 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) 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, 12 gage (2.68 mm).

E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

2.9 FINISHES

A. Fixtures: Manufacturers' standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

2.10 SOURCE QUALITY CONTROL

A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Limit length of fixture whips to 60 inches from box to fixture. Do not run from fixture to fixture with flexible wiring.

C. Support for Fixtures in or on Grid-Type Suspended Ceilings: Do not use ceiling grid or grid support wires for support. Support fixtures independently from structure.

1. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
2. Install at least two independent support rods or wires from structure to tabs on diagonal opposite ends of lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3. Do not use same wires or anchors used to support ceiling.
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 (20-mm) metal channels spanning and secured to ceiling tees and two independent support rods or wires from structure to lighting fixture.

D. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

E. Adjust aimable fixtures to provide required light intensities.

3.2 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

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.

E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 26 51 00

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Exterior luminaires with lamps and ballasts.
2. Poles and accessories.

B. Related Sections include the following:

1. Division 26 Section, "Interior Lighting," for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

A. Correlated Color Temperature (CCT) – a visible light characteristic of comparing a light source to a theoretical, heating black body radiator (measured in degrees kelvin).

B. Effective Projected Area (EPA) – the wind loading of the fixture.

C. HID: High-intensity discharge.

D. International Protection (IP) Rating – delineates the level at which foreign objects and water can intrude inside a device.

E. Luminaire: Complete lighting fixture, including ballast housing if provided.

F. Pole: Luminaire support structure, including tower used for large area illumination.

G. Restriction of Hazardous Substances (RoHS) – products that are RoHS-compliant do not contain any of the following materials: lead (Pb), mercury (Hg), cadmium (Cd), hexavalent

H. Standard: Same definition as "Pole" above.

I. Useful Life – the operating hours before reaching 70% of the initial rated lumen output point with no catastrophic failures under normal conditions.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports and supporting structure, applied as stated in AASHTO LTS-4.

B. Live Load: Single load of 500 lbf (2224 N), distributed as stated in AASHTO LTS-4.

C. Ice Load: Load of 3 lbf/sq. ft. (143.6 Pa), applied as stated in AASHTO LTS-4.

D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.

1. Wind speed for calculating wind load for poles is 100 mph (160 km/h).

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

    a. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Photoelectric relays.
7. Ballasts, including energy-efficiency data.
8. Lamps, including life, output, and energy-efficiency data.
9. Materials, dimensions, and finishes of poles.
10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
11. Anchor bolts for poles.
12. Manufactured pole foundations.

B. Shop Drawings:

1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
2. Wiring Diagrams: Power and control wiring.

C. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

D. IESNA LM-79 report on manufacturer’s standard production model luminaire to include:

1. Testing agency, report number, date, manufacturer's name, catalog number, LED driver, drive current, ambient temperature.
2. Luminaire efficacy (lumens/watt), minimum light output, zonal lumen density.
3. Color qualities (CCT, CRI, chromaticity).
4. ANSI C78.377 Duv.
5. Electrical measurements (input voltage, input current, input power).
6. Spectral distribution over visible wavelengths (mW/nm).
7. Absolute intensity candlepower (cd) summary table.
8. Isocandela plot
9. Photometric file, including BUG rating.

E. IESNA LM-80 report on LED package, array, or module, to include:

1. Testing agency, report number, date, type of equipment, and LED light source being tested.
2. All data required by IESNA LM-80.

F. Qualification Data: For agencies providing photometric data for lighting fixtures.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

I. Warranty: Special warranty specified in this Section.

1.6 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, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70 (2020).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle poles so they will not be damaged.

D. Retain factory-applied pole wrappings on 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.

1.8 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 Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
5. 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 five years from date of Substantial Completion.

B. LED LUMINAIRES

1. The LED manufacturer shall provide a written five-year on-site replacement “finish” warranty for luminaires. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
2. The LED manufacturer shall provide a written five-year on-site replacement warranty for defective or non-starting power supply units and LED source assemblies, which include, but are not limited to, LED packages, LED arrays, LED modules, LED dies, encapsulates, and phosphors.
3. The LED manufacturer shall provide a written five-year on-site replacement warranty for any LED source assembly, package, array, or module, which does not include the power supply, against 10% or more of the individual LEDs in that assembly, package, array, or module failing to illuminate.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 1 for every 10 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. As specified on the drawings or with approval prior to the bid. Approval granted prior to bid is subject, after the bid, to comparison with the specified equipment and to compliance with the plans, specifications and space limitation requirements.

2.2 LUMINAIRES, GENERAL REQUIREMENTS

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. 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.

2.3 LED LUMINAIRES

A. Provide luminaires complete with LED light source and power supply unit. Details, shapes, and dimensions are indicative of the general type desired but are not intended to restrict selection to luminaires of a particular manufacturer. Luminaires of similar design, light distribution and brightness characteristics, and of equal finish and quality will be acceptable.

B. Luminaires shall be UL-listed for wet location and wiring cavities shall be field-accessible for service or repair needs.

C. Operating temperature: -30°C to + 40°C.

D. Luminaires shall be full cutoff or fully-shielded as defined by IESNA RP-8. Alternatively, the full cutoff shall be validated by meeting the following IESNA TM-15 B-U-G ratings (backlight, uplight, and glare):

1. Maximum uplight (U) rating: U1.
2. Maximum glare (G) rating equal: G2.

E. Optical systems for roadway and area luminaires, including the driver, shall be sealed and rated for IP 66 as defined in IEC 60529.

F. Luminaires shall be fully assembled and electrically tested prior to shipment from factory.

G. Coatings shall be capable of surviving ASTM B117 salt fog environment for 1000 hours minimum without blistering or peeling.

H. Coatings shall demonstrate gloss retention greater than or equal to 90% for 1000 hours' exposure QUV test per ATM G 154 UVB313, 4-hour UV-B 60 °C/4-hour condensation 50 °C.

I. Luminaires shall be fully functional after testing for thermal shock according to IEC 60068-2-14.

J. Luminaires shall be tested according to IEC 60068-2-30, damp heat, steady state, for high humidity and high temperatures and be fully functional after testing.

K. Luminaire arm bolts shall be 204 stainless steel or zinc-plated steel.

L. If the lens not integral to the luminaire is used, the optical enclosure (lens/window) shall be constructed from clear and UV-resistant acrylic or UV-treated tempered glass.

M. If a lens not integral to the luminaire, the lens shall be UV treated tempered glass.

N. Efficacy: 100 lumens per watt.

O. Luminaires shall incorporate modular electrical connections and be constructed to allow replacement of all or part of the optics, heat sinks, power supply units, and electrical components using only a simple tool, such as a screwdriver.

P. Luminaires shall bear a nameplate inscribed with the manufacturer's name, address, model number, date of manufacture, and serial number, securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

Q. Luminaires must pass 3G vibration testing in accordance with ANSI C136.31.

R. Luminaires shall have surge protection to meet "C low" waveforms as defined in ANSI/IEEE C62.41.2, Scenario 1 Location Category C.

S. Luminaires shall incorporate provisions to attach a twist-lock style photocell.

T. Wiring: Twist-style wire nuts and tap-style stripless connectors are not acceptable for factory electrical connections.

2.4 POWER SUPPLY UNITS

A. Efficiency: 85%

B. Maximum drive current: 1000 mA.

C. Operating Temperature: -30 °C to +40 °C.

D. Operating Voltage: 120V to 277V nominal. Fluctuation in line voltage up to 15% shall have no visible effect on the luminous output.

E. Operating frequency: 50/60 Hz.

F. Power factor (PF): $\geq$ 0.90.

G. Total current harmonic distortion (THD) for current: $\leq$ 20%.

H. Comply with FCC 47 CFR Section 15, Class B, Non-Consumer RFI/EMI standards.

I. Reduction of hazardous substance- (RohS-) compliant.

J. Driver shall be protected against damage due to either an open-circuit or short-circuit fault condition on the driver output. The driver shall resume normal operation when the fault is removed.

K. Over-temperature protection shall be provided to cut off output power if temperature limit is exceeded. The driver shall resume normal operation when within normal operating temperature.

2.5 LED LIGHT SOURCE

A. Correlated color temperature (CCT) shall be in accordance with ANSI C78.377.

1. Nominal CCT: 3000 K: 3045 $\pm$ 175 K
2. Nominal CCT: 4000 K: 3985 $\pm$ 275 K
3. Nominal CCT: 5000 K: 5028 $\pm$ 283 K
4. Nominal CCT: 6500 K: 6530 $\pm$ 510 K

B. Color Rendering Index (CRI) shall be:

1. $\geq$ 80 for 3000 K – 3500 K

2. $\geq$ 70 for 40000 K – 6500 K

C. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

2.6 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.

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 Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 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 stainless-steel items are indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

2.7 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig (317 MPa); 1-piece construction up to 40 feet (12 meters) in height with access handhole in pole wall.

1. Shape: As scheduled.
2. Mounting Provisions: Butt flange for bolted mounting on foundation.

B. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

C. Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Division 26 Section, "Grounding and Bonding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

E. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

F. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Fasten luminaire to indicated structural supports.

B. Adjust luminaires that require field adjustment or aiming.

3.2 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
2. Install base covers, unless otherwise indicated.
3. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

D. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Steel Conduits: Comply with Division 26 Section, "Raceways and Boxes." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground nonmetallic poles and support structures according to Division 26 Section, "Grounding and Bonding."

1. Install grounding electrode for each pole.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.5 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-64, "Photometric Measurements of Parking Areas."

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.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 26 56 00

SECTION 27 51 00 - COMMUNICATIONS SYSTEMS EQUIPMENT ROUGH-IN ONLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes rough-in provisions for telephone/data system, being provided by others and/or systems being maintained by others.

1.3 RELATED DOCUMENTS

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

B. Section "Raceways and Boxes."

1.4 QUALITY ASSURANCE

A. Coordination: Coordinate requirements for the wiring method with the Owner’s contractor for the equipment being provided and/or existing equipment being maintained.

B. Comply with NFPA 70 (2020).

1.5 COORDINATION

A. Coordinate layout and installation of wiring method components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions: Systems will include indicated additions to existing systems and to new systems where equipment is furnished by the Owner or under another contract.

2.2 EQUIPMENT AND MATERIALS

A. Work under this Section includes only rough-in for systems.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring Method:

1. Unless noted in new walls provide outlet boxes and raceway stub-outs into accessible attic spaces. Provide pull wire in raceways. Conceal raceways except in unfinished spaces.
2. In existing walls where possible provide low-voltage brackets and install cable inside well cavity without raceways. Cut and patch existing walls as required.
3. In ceilings with accessible attic spaces immediately above, provide low-voltage mounting rings.
4. In ceiling without accessible attic spaces immediately above, provide outlet boxes and raceways stub-outs into accessible attic spaces. Provide pull wire in raceways. Conceal raceways except in unfinished spaces.

B. Separation of Wires: Each raceway installed shall be dedicated to a single system.

C. Wall-Mounting and Ceiling- Mounted Outlets: Flush mounted.

END OF SECTION 27 51 00

SECTION 28 51 00 - ELECTRONIC SAFETY AND SECURITY SYSTEMS EQUIPMENT ROUGH-IN ONLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes rough-in provisions for security/access control systems and video surveillance being provided by others and/or existing systems being maintained by others.

1.3 RELATED DOCUMENTS

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

B. Section "Raceways and Boxes."

1.4 QUALITY ASSURANCE

A. Coordination: Coordinate requirements for the wiring method with the Owner’s contractor for the equipment being provided and/or equipment being maintained by others.

B. Comply with NFPA 70 (2020).

1.5 COORDINATION

A. Coordinate layout and installation of wiring method components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions: Systems will include indicated additions to existing systems and to new systems where equipment is furnished by the Owner or under another contract.

2.2 EQUIPMENT AND MATERIALS

A. Work under this Section includes only rough-in provisions for systems.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring Method:

1. Unless noted in new walls provide outlet boxes and raceway stub-outs into accessible attic spaces. Provide pull wire in raceways. Conceal raceways except in unfinished spaces.
2. In existing walls where possible provide low-voltage brackets and install cable inside well cavity without raceways. Cut and patch existing walls as required.
3. In ceilings with accessible attic spaces immediately above, provide low-voltage mounting rings.
4. In ceiling without accessible attic spaces immediately above, provide outlet boxes and raceways stub-outs into accessible attic spaces. Provide pull wire in raceways. Conceal raceways except in unfinished spaces.

B. Separation of Wires: Each raceway installed shall be dedicated to a single system.

C. Wall-Mounting and Ceiling- Mounted Outlets: Flush mounted.

END OF SECTION 28 51 00