

CONSTRUCTION DOCUMENTS SPECIFICATIONS



NEW BASEBALL STADIUM ATHLETIC COMPLEX FACILITY – PHASE 2

Louisiana State University Eunice
Eunice, Louisiana

FP&C Project No. 19-605-22-02, F.19002637
State ID: NEW Site Code:

RHHA Project No. 25-72-25

JEFF LANDRY
Governor, State of Louisiana

TAYLOR F. BARRAS
Commissioner of Administration

MATTHEW BAKER
Director, Facility Planning & Control

February 13, 2026



ARCHITECTS

RHH ARCHITECTS, APAC
200 GOVERNMENT STREET, SUITE 100
BATON ROUGE, LA 70802
P: 225.383.0002 F: 225.383.0302

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ADVERTISEMENT FOR BIDS

Sealed bids will be received for the State of Louisiana by the Division of Administration and shall be directed to the Office of Facility Planning and Control, 1201 North Third Street, Claiborne Office Building, Suite 7-160, Baton Rouge, Louisiana, 70802 or P.O. Box 94095, Baton Rouge, Louisiana, 70804-9095. The deadline for receipt of bids is 2:00 PM on **Wednesday, April 22, 2026**, at which time bids will be opened and read aloud in a public meeting in the Claiborne Office Building, Conference Room 1-145.

FOR: **New Baseball Stadium
Athletic Complex Facility, Phase 2
Louisiana State University Eunice
Eunice, Louisiana**
PROJECT NUMBER: **19-605-22-02, F.19002637**

Complete Bidding Documents for this project are available in electronic form. They may be obtained without charge and without deposit from **<https://www.centerlinebidconnect.com>**. Printed copies are not available from the Designer but arrangements can be made to obtain them through most reprographic firms. Plan holders are responsible for their own reproduction costs.

Questions about this procedure shall be directed to the Designer at:

**RHH Architects, APAC
200 Government Street, Suite 100
Baton Rouge, LA 70802
Telephone: 225-383-0002
E-mail: mike@rhharchitects.com**

All bids shall be accompanied by bid security in an amount of five percent (5.0%) of the sum of the base bid and all alternates. The form of this security shall be as stated in the Instructions to Bidders included in the Bid Documents for this project.

The successful Bidder shall be required to furnish a Performance and Payment Bond written as described in the Instructions to Bidders included in the Bid Documents for this project.

**A PRE-BID CONFERENCE WILL BE HELD
at 11:00 AM on Tuesday, April 07, 2026 at Louisiana State University Eunice,
Dr. Anthony Mumphy Center, Conference Room 126, 2048 Johnson Hwy., Eunice, LA 70535.**

Bids shall be accepted from Contractors who are licensed under LA. R.S. 37:2150-2192 for the classification of **Building Construction**. Bidder is required to comply with provisions and requirements of LA R.S. 38:2212(B)(5). No bid may be withdrawn for a period of forty-five (45) days after receipt of bids, except under the provisions of LA. R.S. 38:2214.

The Owner reserves the right to reject any and all bids for just cause. In accordance with La. R.S. 38:2212(B)(1), the provisions and requirements of this Section and those stated in the bidding documents shall not be waived by any entity.

When this project is financed either partially or entirely with State Bonds or financed in whole or in part by federal or other funds which are not readily available at the time bids are received, the award of this Contract is contingent upon the granting of lines of credit, or the sale of bonds by the Bond Commission or the availability of federal or other funds. The State shall incur no obligation to the Contractor until the Contract Between Owner and Contractor is fully executed.

Facility Planning and Control is a participant in the Small Entrepreneurship (SE) Program (the Hudson Initiative) and the Veteran-Owned and Service-Connected Disabled Veteran-Owned (LaVet) Small Entrepreneurships Program. Bidders are encouraged to consider participation. Information is available from the Office of Facility Planning and Control or on its website at **<https://www.doa.la.gov/doa/fpc/>**.

If you have a disability and would like to request an accommodation in order to participate in this meeting, please contact Cheryl Schilling at **Cheryl.Schilling@la.gov** or (225) 342-6060 as soon as possible but no later than 48 hours before the scheduled meeting.

STATE OF LOUISIANA
DIVISION OF ADMINISTRATION
FACILITY PLANNING AND CONTROL
MATTHEW H. BAKER, DIRECTOR

INSTRUCTIONS TO BIDDERS

COMPLETION TIME:

The Bidder shall agree to fully complete the contract within (420) consecutive calendar days, subject to such extensions as may be granted under Paragraph 8.3, in the General Conditions and the Supplementary Conditions, and acknowledges that this construction time will start on or before the date specified in the written “Notice to Proceed” from the Owner.

LIQUIDATED DAMAGES:

The Bidder shall agree to pay as Liquidated Damages the amount of (One Thousand Six Hundred) Dollars (\$1,600.00) for each consecutive calendar day for which the work is not complete, beginning with the first day beyond the contract completion date stated on the “Notice to Proceed” or as amended by change order.

TAX EXEMPTION:

The project is to be exempt from sales and use taxes imposed by any taxing authority. The successful contractor / subcontractors will be required to submit the appropriate tax exemption form To apply for Louisiana tax exemption, contractors must have a LaTAP account and be registered for Sales Tax in order to submit the application. The Form R-85012 application can now only be filed electronically through Louisiana Taxpayer Access Point (LaTAP). The application must include the LaGov contract number which can be found on the executed contract, a brief project description, Notice to Proceed (NTP) start and end dates, and an uploaded copy of the executed contract. The following is information to include on the form for the project:

Public Entity: Facility Planning and Control

LDR Sales Tax Account #: N/A

For assistance or questions on this process, contact the following:

LaTAP Questions or Assistance: Call (855) 307 3893 or email Taxpayer.AccessPoint@LA.GOV

Application Process Questions: LDRSales.ExemptionApplications@la.gov

General Sales Tax Questions: Sales.inquiries@la.gov

Exemption Qualification Questions: PolicySales@la.gov

Legal Interpretation Questions: PolicySales@la.gov

ARTICLE 1

DEFINITIONS

1.1 The Bid Documents shall include the following:

Advertisement for Bids

Instructions to Bidders

Bid Form

Bid Bond Form

General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition

Supplementary Conditions

Contract Between Owner and Contractor and Performance and Payment Bond and Non-Collusion Affidavit

Attestations Affidavit – 10 day document

User Documents (if applicable)

Pre-Construction Conference Agenda

Schedule of Values

Change Order Form

Recommendation of Acceptance

Partial Occupancy Form

Building Plaque (*if applicable*)

Asbestos Abatement (*if applicable*)

Other Documents (*if applicable*)

Specifications & Drawings

Addenda issued during the bid period to be acknowledged on the Bid Form

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201 and the Supplementary Conditions are applicable to the Bid Documents.

1.3 Addenda are written and/or graphic instruments issued by the Designer prior to the opening of bids, which modify or interpret the Bid 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 Bid 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, or deleted 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 Bid 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 Bid Documents.

1.8 A 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 Designer of record of the project, regardless of discipline.

ARTICLE 2

PRE-BID CONFERENCE

2.1 A Pre-Bid Conference shall be held at least 10 days before the date for receipt for bids. The Designer shall coordinate the setting of the date, time and place for the Pre-Bid Conference with the User and shall notify, in writing, the Owner and all who have received sets of the Bid Documents to attend. The purpose of the Pre-Bid Conference is to familiarize Bidders with the requirements of the Project and the intent of the Bid Documents, and to receive comments and information from interested Bidders. If the Pre-Bid Conference is stated in the Advertisement for Bids to be a Mandatory Pre-Bid Conference, bids shall be accepted only from those Bidders who attend the Pre-Bid Conference. Bidders who are not in attendance for the **entire** Pre-Bid Conference will be considered to have not attended.

2.2 Any revision of the Bid Documents made as a result of the Pre-Bid Conference shall not be valid unless included in an addendum.

ARTICLE 3

BIDDER'S REPRESENTATION

3.1 Each Bidder by making his bid represents that:

3.1.1 He has read and understands the Bid Documents and his bid is made in accordance therewith.

3.1.2 He has visited the site and has familiarized himself with the local conditions under which the work is to be performed.

3.1.3 His bid is based solely upon the materials, systems and equipment described in the Bid Documents, as advertised and as modified by addenda.

3.1.4 His bid is not based on any verbal instructions contrary to the Bid Documents and addenda.

3.1.5 He is familiar with Code of Governmental Ethics requirement that prohibits public servants and/or their immediate family members from bidding on or entering into contracts; he is aware that the Designer and its principal owners are considered Public Servants under the Code of Governmental Ethics for the limited purposes and scope of the Design Contract with the State on this Project (see Ethics Board Advisory Opinion, No. [2009-378](#) and [2010-128](#)); and neither he nor any principal of the Bidder with a controlling interest therein has an immediate family relationship with the Designer or any principal within the Designer's firm ([see La. R.S. 42:1113](#)). Any Bidder submitting a bid in violation of this clause shall be disqualified and any contract entered into in violation of this clause shall be null and void.

3.2 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 Bidder shall be responsible for determining that all of his Sub-bidders or prospective Subcontractors are duly licensed in accordance with law.

ARTICLE 4

BID DOCUMENTS

4.1 Copies

4.1.1 The Designer shall provide the Bid Documents in electronic format. They may be obtained without charge and without deposit as stated in the Advertisement for Bids.

4.1.2 Printed copies will not be available from the Designer, but arrangements can be made to obtain them through most reprographic firms and/or plan rooms. All plan holders are responsible for their own reproduction costs.

4.1.3 Complete sets of Bid Documents shall be used in preparing bids; neither the Owner nor the Designer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

4.1.4 The Owner or Designer in making the Bid 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.

4.2 Interpretation or Correction of Bid Documents

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

4.2.2 Bidders requiring clarification or interpretation of the Bid Documents shall make a written request to the Designer, at least seven days prior to the date for receipt of bids.

4.2.3 Any interpretation, correction or change to the Bid Documents will be made by addendum. Interpretations, corrections or changes to the Bid Documents made in any other manner will not be binding and Bidders shall not rely upon such interpretations, corrections and changes.

4.3 Substitutions

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

substitutions shall be in accordance with La. R.S. 38:2212(T)(2).

4.3.2 For closed specifications, when a potential supplier submits a particular product for prior approval other than a product specified in the Bid Documents, said product will not be considered unless written request for approval has been submitted by the Bidder and has been received by the Designer at least fourteen (14) working days prior to the opening of bids. (La. R.S. 38:2295(C)) 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 substitution, 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 substitution would require shall be included. It shall be the responsibility of the Bidder to include in his bid all changes required of the Bid Documents if the proposed product is used. Prior approval, if given, is contingent upon supplier being responsible for any costs which may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved.

4.3.3 If the Designer approves any proposed substitution, such approval shall be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

4.4 Addenda

4.4.1 Addenda will be transmitted to all who are known by the Designer to have requested and/or received a complete set of Bid Documents.

4.4.2 Copies of addenda will be made available for inspection wherever Bid Documents are on file for that purpose.

4.4.3 In accordance with La. R.S. 38:2212(O)(2)(b) addenda shall not be issued within a period of seventy-two (72) hours prior to the advertised time for the opening of bids, excluding Saturdays, Sundays, and any other legal holidays. If the necessity arises of issuing an addendum modifying plans and specifications within the seventy-two (72) hour period prior to the advertised time for the opening of bids, then the opening of bids shall be extended at least seven but no more than tw

enty-one (21) working days, without the requirement of re-advertising. FPC shall be consulted prior to issuance of such an addendum and shall approve such issuance. The revised time and date for the opening of bids shall be stated in the addendum.

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

4.4.5 The Owner shall have the right to extend the bid date by up to (30) thirty days without the requirement of re-advertising. Any such extension shall be made by addendum issued by the Designer.

ARTICLE 5

BID PROCEDURE

5.1 Form and Style of Bids

5.1.1 Bids shall be submitted on the Louisiana Uniform Public Work Bid Form provided by the Designer for this project.

5.1.2 The Bidder shall ensure that all applicable blanks on the Bid Form are completely and accurately filled in.

5.1.3 Bid sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.

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

5.1.5 Bidders are cautioned to complete all alternates should such be required in the Bid Form. Failure to submit alternate prices will render the bid non responsive and shall cause its rejection.

5.1.6 Bidders are cautioned to complete all unit prices should such be required in the Bid Form. Unit prices represent a price proposal to do a specified quantity and quality of work. Unit prices are incorporated into the base bid or alternates, as indicated on the Unit Price Form, but are not the sole components thereof.

5.1.7 Bidder shall make no additional stipulations on the Bid Form nor qualify his bid in any other manner.

5.1.8 Written evidence of the authority of the person signing the bid for the public work shall be submitted in accordance with La. R.S. 38:2212(B)(5).

5.1.9 On any bid in excess of fifty thousand dollars (\$50,000.00), the Bidder shall certify that he is licensed under La. R.S. 37: 2150-2173 and show his license number on the bid above his signature or his duly authorized representative.

5.2 Bid Security

5.2.1 No bid shall be considered or accepted unless the bid is accompanied by bid security in an amount of five percent (5.0%) of the base bid and all 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 and signed by the surety's agent or attorney-in-fact. The Bid Bond shall be written on the Facility Planning and Control Bid Bond Form, and the surety for the bond must meet the qualifications stated thereon. The Bid Bond shall include the legal name of the Bidder, be in favor of the State of Louisiana, Division of Administration, Office of FPC, and shall be accompanied by appropriate power of attorney. The Bid Bond must be signed by both the Bidder/principal and the surety in the space provided on the FPC Bid Bond Form. Failure by the Bidder/principal or the surety to sign the Bid Bond shall result in the rejection of the bid.

Bid security furnished by the Bidder shall guarantee that the Bidder 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 Bid Documents, within fifteen (15) 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.

5.2.2 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.

5.3 Submission of Bids

5.3.1 The bid shall be sealed in an opaque envelope. 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.

The envelope shall not contain multiple bid forms, and will be received until the time specified and at the place specified in the Advertisement for Bids. It shall be the specific responsibility of the Bidder to deliver his sealed bid to FPC at the appointed place and prior to the announced time for the opening of bids. Late delivery of a bid for any reason, including late delivery by United States Mail, express delivery, or misdirection by any party, shall disqualify the bid.

If the bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "Bid Enclosed" on the face thereof. Such bids shall be sent by Registered or Certified Mail, Return Receipt Requested, addressed to:

Facility Planning and Control,
P. O. Box 94095
Baton Rouge, Louisiana, 70804-9095.

Bids sent by express delivery shall be delivered to:

Facility Planning and Control
Suite 7-160
Claiborne Office Building
1201 North Third Street
Baton Rouge, Louisiana 70802

If the bid is hand delivered, it shall be delivered to:

Facility Planning and Control
Suite 7-160
Claiborne Office Building
1201 North Third Street
Baton Rouge, Louisiana 70802

On the bid opening day, 15 minutes prior to the appointed time for the opening of bids, the bid may be delivered to the Claiborne Conference Room 1-145.

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

5.3.3 Bidder shall assume full responsibility for timely delivery at location designated for receipt of bids.

5.3.4 Oral, telephonic or telegraphic bids are invalid and shall not receive consideration. Owner shall not consider notations written on outside of bid envelope which have the effect of amending the bid. Written modifications enclosed in the bid envelope, and signed or initialed by the Contractor or his representative, shall be accepted.

5.4 Modification or Withdrawal of Bid

5.4.1 A bid may not be modified, withdrawn or canceled 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 [La. R.S. 38:2214](#) which states, in part, "Bids containing patently obvious, unintentional, and substantial mechanical, clerical, or mathematical errors, or errors of unintentional omission of a substantial quantity of work, labor, material, or services made directly in the compilation of the bid, may be withdrawn by the contractor if clear and convincing sworn, written evidence of such errors is furnished to the public entity within forty-eight hours of the bid opening excluding Saturdays, Sundays, and legal holidays".

5.4.2 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.

5.4.3 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.

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

5.5 Prohibition of Discriminatory Boycotts of Israel

By submitting a bid, the Bidder certifies and agrees that the following information is correct:

In preparing its bid, the Bidder has considered all proposals submitted from qualified, potential subcontractors and suppliers, and has not, in the solicitation, selection, or commercial treatment of any subcontractor or supplier, refused to transact or terminated business activities, or taken other actions intended to limit commercial relations, with a person or entity that is engaging in commercial transactions in Israel or Israel-controlled territories, with the specific intent to accomplish a boycott or divestment of Israel. The Bidder has also not retaliated against any person or other entity for reporting such refusal, termination, or commercially limiting actions. The state reserves the right to reject any bid if this certification is subsequently determined to be false and to terminate any contract awarded based on such a false response.

ARTICLE 6

CONSIDERATION OF BIDS

6.1 Opening of Bids

6.1.1 The properly identified Bids received on time will be opened publicly and will be read aloud, and a tabulation abstract of the amounts of the base bids and alternates, if any, will be made available to Bidders after bid opening at <https://www.doa.la.gov/doa/fpc/project-administration-state/construction-bid-advertisements-and-results/>

6.2 Rejection of Bids

6.2.1 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 Bid Documents or a bid in any way incomplete or irregular.

6.3 Acceptance of Bid

6.3.1 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.

ARTICLE 7

POST-BID INFORMATION

7.1 Submissions

7.1.1 At the Pre-Construction Conference, the Contractor shall submit the following information to the Designer.

7.1.1.1 A designation of the work to be performed by the Contractor with his own forces.

7.1.1.2 A breakdown of the Contract cost attributable to each item listed in the Schedule of Values Form. No payments will be made to the Contractor until this is received.

7.1.1.3 The proprietary names and the suppliers of principal items or systems of material and equipment proposed for the work.

7.1.1.4 A list of names and business domiciles of all Subcontractors, manufacturers, suppliers or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work. It is the preference of the Owner that, to the greatest extent possible or practical, the Contractor utilize Louisiana Subcontractors, manufacturers, suppliers and labor.

7.1.2 The General Contractor shall be responsible for actions or inactions of Subcontractors and/or material suppliers.

The General Contractor is totally responsible for any lost time or extra expense incurred due to a Subcontractor's or Material Supplier's failure to perform. Failure to perform includes, but is not limited to, a Subcontractor's financial failure, abandonment of the project, failure to make prompt delivery, or failure to do work up to standard. Under no circumstances shall the Owner mitigate the General Contractor's losses or reimburse the General Contractor for losses caused by these events.

7.1.3 The lowest responsive and responsible Bidder shall submit to the Designer and the Owner within ten days after the bid opening a letter/letters from the manufacturer stating that the manufacturer will issue the roof system guarantee complying with the requirements of FPC based on the specified roof system and include the name of the applicator

acceptable to the manufacturer at the highest level of certification for installing the specified roof system. This manufacturer shall be one that has received prior approval or is named in the specifications.

In accordance with La. [R.S. 38:2227](#) [references La. R.S. 38:2212(A)(3)(c)(ii), which has since been renumbered as [La. R.S. 38:2212\(B\)\(3\)\(a\)](#)], La. R.S. [38:2212.10](#) and [La. R.S. 23:1726\(B\)](#) the apparent low Bidder on this project shall submit the completed Attestations Affidavit (Past Criminal Convictions of Bidders, Verification of Employees and Certification Regarding Unpaid Workers Compensation Insurance) form found within this bid package to FPC within 10 days after the opening of bids. The Attestations Affidavit may also be submitted in the bid envelope.

ARTICLE 8

PERFORMANCE AND PAYMENT BOND

8.1 Bond Required

8.1.1 The Contractor shall furnish and pay for a Performance and Payment Bond written by a company licensed to do business in Louisiana, which shall be signed by the surety's agent or attorney-in-fact, 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. The Bond shall be in favor of the

State of Louisiana, Office of Facility Planning and Control.

8.2 Time of Delivery and Form of Bond

8.2.1 The Contractor shall deliver the required bond to the Owner simultaneous with the execution of the Contract.

8.2.2 Bond shall be in the form furnished by FPC, Entitled Contract Between Owner And Contractor And Performance And Payment Bond, a copy of which is included in the Bid Documents.

8.2.3 The Contractor 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 9

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

9.1 Form to be Used

9.1.1 Form of the Contract to be used shall be furnished by FPC, an example of which is bound in the Bid Documents.

9.2 Award

9.2.1 After award of the Contract and prior to Contract execution, the successful Bidder, if a corporation, shall have on file with the Louisiana Secretary of State, a Disclosure of Ownership Affidavit, in accordance with [La. R.S. 12:1-1622, 12:205\(C\)](#) and [12:304\(A\)\(11\)](#).

9.2.2 In accordance with Louisiana Law, when the Contract is awarded, the successful Bidder shall, at the time of the signing of the Contract, execute the Non-Collusion Affidavit included in the Contract Documents

9.2.3 When this project is financed either partially or entirely with State Bonds, the award of this Contract is contingent upon the sale of bonds by the State Bond Commission. The State shall incur no obligation to the Contractor until the Contract Between Owner and Contractor is duly executed.

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: **Division of Administration, State of Louisiana**
Office of Facility Planning and Control
Claiborne Office Building, 1201 North Third Street
PO Box 94095 Baton Rouge, LA 70804

BID FOR: New Baseball Stadium
Athletic Complex Facility, Phase 2
Louisiana State University Eunice

Project: 19-605-22-02, WBS: F.19002637

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: RHH Architects, APAC, located at 200 Government Street, Suite 100, Baton Rouge, Louisiana 70802 and dated: 02/13/2026
(Owner to provide name of entity preparing bidding documents.)

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

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

_____ Dollars (\$ _____)

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

Alternate No. 1 - Add Brick Pilaster Columns at Existing Video Board for the lump sum of:

_____ Dollars (\$ _____)

Alternate No. 2 – Add Field Level Drink Rail Seating for the lump sum of:

_____ Dollars (\$ _____)

Alternate No. 3 (Owner to provide description of alternate and state whether add or deduct) for the lump sum of:

Not Applicable _____ Dollars (\$ _____ N/A _____)

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.

BID BOND
FOR
FACILITY PLANNING AND CONTROL PROJECTS

Date: _____

KNOW ALL MEN BY THESE PRESENTS:

That _____ of _____, as Principal, and _____, as Surety, are held and firmly bound unto the State of Louisiana, Division of Administration, Office of Facility Planning and Control (Obligee), in the full and just sum of five (5%) percent of the total amount of this proposal, including all alternates, lawful money of the United States, for payment of which sum, well 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 than 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: _____
AUTHORIZED OFFICER-OWNER-PARTNER

BY: _____
AGENT OR ATTORNEY-IN-FACT(SEAL)

July 2021

FOR INFORMATION ONLY

This document will be prepared by Facility Planning & Control in the form appropriate for the project.

STATE OF LOUISIANA
PARISH OF «PARISH OF PROJECT»

CONTRACT BETWEEN OWNER AND CONTRACTOR
AND PERFORMANCE AND PAYMENT BOND

This agreement entered into this _____ day of _____, 2026, by «Contractor» hereinafter called the "Contractor", whose business address is «Contractor Address», «Contractor City», «Contractor State» «Contractor Zip», and the State of Louisiana Division of Administration, herein represented by the contracting officer executing this contract, hereinafter called the "Owner".

Witnesseth that the Contractor and the Owner, in consideration of premises and the mutual covenants; consideration and agreement herein contained, agree as follows:

Statement of Work: The contractor shall furnish all labor and materials and perform all of the work required to build, construct and complete in a thorough and workmanlike manner:

«Project_Reference_1»
«Project_Reference_2»
«Project_Reference_3»
«Project_City», Louisiana
Project No.: «ProjectNo», «Part_No»«WBS»;
 «Supplement_Project_No», Part «Supplement_Part_No»
 («Supplement_WBS»)(Supplement)
State ID No.: «StateID» Site Code: «SiteCode»

in strict accordance with Contract Documents prepared by:

«Designer»
«Designer_Address»
«Designer_City», «Designer_State» «Designer_Zip»

It is recognized by the parties herein that said Contract Documents including by way of example and not of limitation, the Drawings and Specifications dated «Drawings and Specs Date», Addenda number(s) «Addenda No», the Instruction to Bidders, Bid Form, General Conditions, Supplementary Conditions, any Addenda thereto, impose duties and obligations upon the parties herein, and said parties thereby agree that they shall be bound by said duties and obligations. For these purposes, all of the provisions contained in the aforementioned Construction Documents are incorporated herein by reference with the same force and effect as though said Construction Documents were herein set out in full.

Time for Completion: The work shall be commenced on a date to be specified in a written order of the Owner and shall be completed within «Time Completion Days» («Time Completion Days») consecutive calendar days from and after the said date.

Liquidated Damages: Contractor shall be assessed Liquidated Damages in the amount of «Liquidated Damages Cost Per Day» per day for each consecutive calendar day which work is not complete beginning with the first day beyond the completion time.

Compensation to be paid to the Contractor: The Owner will pay and the Contractor will accept in full consideration for the performance of the contract the sum of «Contract Amount Words» and No/100 Dollars («Contract Amount Numeral») which sum represents the «Base Bid Only or Plus Alternates»

Taxes: Contractor hereby agrees that the responsibility for payment of taxes from the funds thus received under this Contract and/or legislative appropriation shall be contractor's obligation and identified under Federal tax identification number _____.

Performance and Payment Bond: To these presents personally came and intervened _____, herein acting for _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Louisiana, as surety, who declared that having taken cognizance of this contract and of the Construction Documents mentioned herein, he hereby in his capacity as its Attorney in Fact obligates his said company, as Surety for the said Contractor, unto the said Owner, up to the sum of «Contract Amount Words» and No/100 Dollars («Contract Amount Numeral»). By issuance of this bond, the surety acknowledges they are in compliance with R.S. 38:2219.

The condition of this performance and payment bond shall be that should the Contractor herein not perform the contract in accordance with the terms and conditions hereof, or should said Contractor not fully

indemnify and save harmless the Owner, from all cost and damages which he may suffer by said Contractor's non-performance or should said Contractor not pay all persons who have and fulfill obligations to perform labor and/or furnish materials in the prosecution of the work provided for herein, including by way of example workmen, laborers, mechanics, and furnishers of materials, machinery, equipment and fixtures, then said Surety agrees and is bound to so perform the contract and make said payment(s).

Provided, that any alterations which may be made in the terms of the contract or in the work to be done under it, or the giving by the Owner of any extensions of time for the performance of the contract, or any other forbearance on the part of either the Owner or the Contractor to the other shall not in any way release the Contractor or the Surety from their liability hereunder, notice to the Surety of any such alterations, extensions or other forbearance being hereby waived.

Contractor acknowledges and agrees to comply with the provisions of La. R.S. 38:2212.10 and federal law pertaining to E-Verify in the performance of services under this Contract.

It is hereby agreed that the Legislative Auditor of the State of Louisiana and/or the Office of the Governor, Division of Administration auditors shall have the option of auditing all accounts of contractor which relate to this contract.

The continuation of this contract is contingent upon the appropriation of funds to fulfill the requirements of the contract by the legislature. If the legislature fails to appropriate sufficient monies to provide for the continuation of the contract, or if such appropriation is reduced by the veto of the Governor or by any means provided in the appropriations act to prevent the total appropriation for the year from exceeding revenues for that year, or for any other lawful purpose, and the effect of such reduction is to provide insufficient monies for the continuation of the contract, the contract shall terminate on the date of the beginning of the first fiscal year for which funds are not appropriated.

The contractor agrees to abide by the requirements of the following as applicable: Title VI of the Civil Rights Act of 1964 and Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972, Federal Executive Order 11246 as amended, the Rehabilitation Act of 1973, as amended, the Vietnam Era Veteran's Readjustment Assistance Act of 1974, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, the Fair Housing Act of 1968 as amended, and contractor agrees to abide by the requirements of the Americans with Disabilities Act of 1990.

Contractor agrees not to discriminate in its employment practices, and will render services under this contract without regard to race, color, religion, sex, sexual orientation, national origin, veteran status, political affiliation, disability, or age in any matter relating to employment. Any act of discrimination committed by Contractor, or failure to comply with these statutory obligations when applicable shall be grounds for termination of this contract.

In accordance with R.S. 39:1602.1, effective May 22, 2018, for any contract for \$100,000 or more and for any contractor with five or more employees, Contractor, or any Subcontractor, shall certify it is not engaging in a boycott of Israel, and shall, for the duration of this contract, refrain from a boycott of Israel. The State reserves the right to terminate this contract if the Contractor, or any Subcontractor, engages in a boycott of Israel during the term of the contract.

In accordance with La. R.S. 39:1602.2, the following applies to any competitive sealed bids, competitive sealed proposals, or contract(s) with a value of \$100,000 or more involving a for-profit company with at least fifty full-time employees:

Unless otherwise exempted by law, by submitting a response to this solicitation or entering into this contract, the Bidder, Proposer or Contractor certifies the following:

1. The company does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association based solely on the entity's or association's status as a firearm entity or firearm trade association;
2. The company will not discriminate against a firearm entity or firearm trade association during the term of the contract based solely on the entity's or association's status as a firearm entity or firearm trade association.

The State reserves the right to reject the response of the Bidder, Proposer or Contractor if this certification is subsequently determined to be false, and to terminate any contract awarded based on such a false response or if the certification is no longer true.

Contractor has a continuing obligation to disclose any suspensions or debarment by any government entity, including but not limited to General Services Administration (GSA). Failure to disclosed may constitute grounds for suspension and/or termination of the Contract and debarment from future Contracts.

Contractor, and each tier of Subcontractors, shall certify that it is not on the List of Parties Excluded from Federal Procurement or Nonprocurement Programs promulgated in accordance with E.O.s 12549 and 12689, "Debarment and Suspension," as set forth at 24 CFR part 24.

In Witness whereof, the parties hereto on the day and year first above written have executed this agreement in six (6) counterparts, each of which shall, without proof or accountancy for the other counterparts, be deemed an original thereof.

THUS DONE AND SIGNED at Baton Rouge, Louisiana, on the day, month, and year first written above.

WITNESSES:

FP&C Witness #1 Sign Here

FP&C Witness #2 Sign Here

Contractor Witness #1 Sign Here

Contractor Witness #2 Sign Here

Surety Witness #1 Sign Here

Surety Witness #2 Sign Here

STATE OF LOUISIANA
DIVISION OF ADMINISTRATION

BY: _____
MATTHEW H. BAKER,
FP&C DIRECTOR

BY: _____
«CONTRACTOR»

SURETY:

BY: _____
ATTORNEY IN FACT

ADDRESS

TELEPHONE NUMBER

PROJECT NO.:«ProjectNo», «Part_No»«WBS»;
«Supplement Project No», Part
«Supplement Part No» («Supplement WBS»)(Supplement)
NAME: «Project_Reference_1»
«Project_Reference_2»
«Project_Reference_3»
LOCATION: «Project_City»

NON-COLLUSION AFFIDAVIT

Before me, the undersigned authority, duly commissioned and qualified within and for the State and Parish aforesaid, personally came and appeared _____ representing «Contractor» who, being by me first duly sworn deposed and said that he has read this affidavit and does hereby agree under oath to comply with all provisions herein as follows:

PART I.

Section 2224 of Part II of Chapter 10 of Title 38 of the Louisiana Revised Statutes, as amended.

(1) That affiant employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for affiant; and

(2) That no part of the Contract price received by affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the Contract, other than the payment of their normal compensation to persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for affiant.

PART II.

Section 2190 of Part I of Chapter 10 of Title 38 of the Louisiana Revised Statutes, as amended.

That affiant, if an architect or engineer, or representative thereof, does not own a substantial financial interest, either directly or indirectly, in any corporation, firm, partnership, or other organization which supplies materials for the construction of a public work when the architect or engineer has performed architectural or engineering services, either directly or indirectly, in connection with the public work for which the materials are being supplied.

For the purposes of this Section, a "substantial financial interest" shall exclude any interest in stock being traded on the American Stock Exchange or the New York Stock Exchange.

That affiant, if subject to the provisions of this section, does hereby agree to be subject to the penalties involved for the violation of this section.

AFFIANT

SWORN TO AND SUBSCRIBED BEFORE ME THIS _____ DAY OF _____, 2026.

NOTARY

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 Section, Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Section, Article, Paragraph, Subparagraph or Clause shall remain in effect.

Articles, Sections, 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 Section 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.

1.1.8 Initial Decision Maker

Delete all after the words, “shall not show partiality to the Owner or Contractor”.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE [REFER TO *La 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”.

1.7 DIGITAL DATA USE AND TRANSMISSION

In the first sentence after the words, “in digital form” delete “. The parties will use AIA Document E203 2013, Building Information Modeling and Digital Data Exhibit”.

1.8 BUILDING INFORMATION MODELS USE AND RELIANCE

Delete Section 1.8.

ARTICLE 2

OWNER

2.2 EVIDENCE OF THE OWNER’S FINANCIAL ARRANGEMENTS

Delete Section 2.2.

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.3.1 In the first sentence, delete: all before “the Owner shall secure...”

Delete Section 2.3.2 and substitute the following:

2.3.2 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.

2.3.3 Delete the words: “to whom the Contractor has no reasonable objection and”.

ARTICLE 3

CONTRACTOR

3.4 LABOR AND MATERIALS

3.4.2 Delete Section 3.4.2.

Delete Section 3.4.3 and substitute with the following:

3.4.3 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 Section. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

3.5 WARRANTY

3.5.2 Replace reference to “Section 9.8.4” with “Section 9.8.6”.

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

3.7.1 Delete Section 3.7.1.

3.7.2 In Section 3.7.2, replace the word “public” with the word “State”.

Delete Section 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 La R.S. 8:671 et seq., the Office of Coastal Protection and Restoration, 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 Sections 3.8.1, 3.8.2, and 3.8.3 in their entirety and add the following new Section 3.8.1:

- 3.8.1 Allowances shall not be made on any of the Work.

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 AND SUBMITTAL 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 shall be made until this schedule is received.

- 3.10.3 In the first sentence, delete the word "general".

After the first sentence, 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 Section 14.2.

Add the following Sections:

- 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 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

4.2 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,”

4.2.4 In the first sentence, delete all after “The Owner and Contractor”, and add the following “may communicate directly with each other, when deemed necessary by the Owner, and the Owner will notify the Architect of any decision.”

4.2.10 Add the following sentence to the end of Section 4.2.10: There shall be no restriction on the Owner having a Representative.

4.2.11 Add the following sentence to the end of Section 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 Section 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 Section 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 Section 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 nonperformance of a subcontractor.

Delete Sections 5.2.3 and 5.2.4 and substitute the following:

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

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Delete Sections 5.4, 5.4.1, 5.4.2 and 5.4.3

ARTICLE 7

CHANGES IN THE WORK

7.1 GENERAL

Add the following Sections:

- 7.1.4 As part of the pre-construction conference submittals, the Contractor shall submit the following prior to the Contractor's initial request for payment:
- 7.1.4.1 Fixed job site overhead cost itemized with documentation to support daily rates.
- 7.1.4.2 Bond Premium Rate with supporting information from the General Contractor's carrier.

7.1.4.3 Labor Burden by trade for both Subcontractors and General Contractor. The Labor Burden shall be supported by the Worker's Compensation and Employer's Liability Insurance Policy Information Page. Provide for all trades.

7.1.4.4 Internal Rate Charges for all significant company owned equipment.

7.1.5 If the General Contractor fails to submit the aforementioned documentation as part of the pre-construction submittals, then pay applications shall not be processed until such time as the Owner receives this information.

7.2 CHANGE ORDERS

Delete Section 7.2.1, and substitute the following Sections:

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, the Architect, and the Contractor issued after execution of the Contract, authorizing a change in the Work and/or an adjustment in the Contract Sum and/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 shall have no effect.

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

7.2.2.1 Actual wages paid directly to labor personnel, with a labor burden markup exclusively limited to applicable payroll taxes, worker's compensation insurance, unemployment compensation, and social security taxes for those labor personnel performing the Work. Wages shall be the basic hourly labor rate paid an employee exclusive of fringe benefits or other employee costs. The labor burden percentage for the "Cost of the Work" is limited to categories listed herein. Employer-provided health insurance, fringe benefits, employee training (whether a requirement of employment or not), vacation pay, etc., are examples of ineligible labor burden costs which **shall not** be included, as these costs are already compensated by the Overhead and Profit markup.

Supervision shall not be included as a line item in the "Cost of the Work", except when the change results in a documented delay in the critical path, as described in Section 7.2.7.

7.2.2.2 Cost of all materials and supplies necessary and required to perform the Work, identifying each item and its individual cost, including taxes. Incidental consumables are not eligible costs and shall not be included.

7.2.2.3 Cost of each necessary piece of machinery and equipment required to perform the Work, identifying each item and its individual cost, including taxes. Incidental small tools of a specific trade (i.e., shovels, saws, hammers, air compressors, etc.,) and general use vehicles, such as pickup trucks even for

moving items around the site, fuel for these general use vehicles, travel, lodging, and/or meals are not eligible and shall not be included.

7.2.2.4 Eligible Insurance costs shall be limited to documented increases in “Builder’s Risk” insurance premium / costs only. Commercial General Liability, Automobile Liability, and all other required insurances, where referenced in the Contract shall be considered part of normal overhead. These costs are already compensated by the Overhead and Profit markup.

7.2.2.5 Cost for the General Contractor Performance and Payment Bond premium, where the documented cost of the premiums have been increased due to the Change Order.

7.2.3 Overhead and Profit - The Contractor and Subcontractor shall be due home office fixed overhead and profits on the Cost of the Work, but shall not exceed a total of 16% 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, including overhead and profit. Where a change results in both credits to the Owner and extras to the Contractor for related items, overhead and profit shall be computed for credits to the Owner and extras to the Contractor. The Owner shall receive full credit for the computed overhead and profit on credit change order items.

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 Section 7.2.2) and Overhead and Profit (as defined at Section 7.2.3), and shall be computed as follows:

7.2.4.1 When all of the Work is General Contractor Work; 8% markup on the Cost of the Work.

7.2.4.2 When the Work is all Subcontract Work; 8% markup on the Cost of the Work for Subcontractor’s Overhead and Profit, plus 8% 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 Contractor Work and Subcontract Work; that portion of the direct cost that is General Contract Work shall be computed per Section 7.2.4.1 and that portion of the direct cost that is Subcontract Work shall be computed per Section 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.

Premiums for the Subcontractor’s Bond shall not be included.

7.2.4.4 Subcontract cost shall consist of the items in Section 7.2.2 above plus Overhead and Profit as defined in Section 7.2.3.

7.2.5 Before a Change Order is prepared, the Contractor shall prepare 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 Extended fixed job-site costs are indirect costs that are necessary to support the work in the field. Examples of fixed job-site costs are field office rental, salaries of field office staff, field office utilities, and telephone.

Extended fixed job-site costs or equitable adjustment may be included in a Change Order due to a delay in the critical path, with the exception of weather related delays. In the event of a delay in the critical path, the Contractor shall submit all changes or adjustments to the Contract Time **within twenty-one (21) days** of the event giving rise to the delay. The Contractor shall submit documentation and justification for the adjustment by performing a critical path analysis of its most recent schedule in use prior to the change, which shows an extension in critical path activities.

The Contractor shall notify the Architect in writing that the Contractor is making a claim for extended fixed job-site overhead as required by Section 15.1.2. The Contractor shall provide proof that the Contractor is unable to mitigate financial damages through Alternate Work within this Contract or replacement work. "Replacement Work" is that work which the Contractor is obligated to perform under any construction contract separate from this Contract. Reasonable proof shall be required by the Architect that the delays affected the Completion Date.

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

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

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

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

7.2.8.4 Cost of supervision refer to section 7.2.2.1, with exception as provided in Section 7.2.7.

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” insert: “, but not to exceed a specified amount”.

7.3.4 From .1 of the list, delete all after “Costs of labor, including” and substitute the following “social security, old age and employment insurance, applicable payroll taxes, and workers’ compensation insurance;”

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

Delete Section 7.3.9 and substitute the following:

7.3.9 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 Section 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 not later than fourteen (14) days after the transmittal date of 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 Section 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 binding dispute resolution” 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 rights for future claims for that month are waived.”

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

Delete Section 9.1.2.

Delete Section 9.2 and substitute the following:

9.2 SCHEDULE OF VALUES

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 shall not be modified without approval from the Owner and Architect.

9.3 APPLICATIONS FOR PAYMENT

Delete Sections 9.3.1, 9.3.1.1, and 9.3.1.2 and substitute the following:

- 9.3.1 Monthly, the Contractor shall submit to the Architect a Facility Planning and Control – Application and Certification for Payment form, 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 La 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 shall be made until the revised schedule required by Section 3.10.1 is received.

9.3.1.4 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 Section 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

Section 9.5.1.7: Delete the word "repeated".

Delete Section 9.5.4.

9.6 PROGRESS PAYMENTS

Delete Section 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 except for projects funded fully or in part by a Federal reimbursement program. For such projects the Owner will make payment in a timely manner consistent with reimbursement.

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:

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

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

Pursuant to La. R.S. 38:2242 and La. R.S. 38:2242.2, when the Owner receives any claim of nonpayment arising out of the Contract, the Owner shall deduct 125% of such claim from the Contract Sum. The Contractor, or any interested party, may deposit security, in accordance with La. R.S. 38:2242.2, guaranteeing payment of the claim with the recorder

of mortgages of the parish where the Work has been done. When the Owner receives original proof of such guarantee from the recorder of mortgages, the claim deduction will be added back to the Contract Sum.

Delete Section **9.7 FAILURE OF PAYMENT.**

Delete Section 9.8 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 Section.
- 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 shall make an inspection to determine whether the Work is substantially complete. A prerequisite to the Work being considered as substantially complete is the Owner's receipt of the executed Roofing Contractor's and Roofing Manufacturer's guarantees, where roofing Work is part of the Contract. 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. 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 forty-five 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 Recommendation of Acceptance incorporating the punch list and submit it to the Owner. Upon approval of the Recommendation of Acceptance, the Owner may issue a Notice of Acceptance of Building Contract which shall establish the Date of Substantial Completion. The Contractor shall record the Notice of Acceptance with the Clerk of Court in the Parish in which the Work has been performed. If the Notice of Acceptance 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 Recommendation of Acceptance. The Owner shall not be responsible for payment for any Work associated with change orders that is not incorporated into the contract at the time of the Recommendation of Acceptance.
- 9.8.6 Warranties required by the Contract Documents shall commence on the date of Acceptance 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 forty-five (45) day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within forty-five (45) 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

Delete Section 9.9.1 and substitute the following:

- 9.9.1 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 Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Delete Section 9.10.4 and replace with the following:

9.10.4 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;

9.10.4.3 terms of special warranties required by the Contract Documents; or

9.10.4.4 audits performed by the Owner, after final payment.

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 second 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.”

Delete Section 10.4 and substitute the following:

10.4 EMERGENCIES

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

AIA A101 – 2017 Exhibit A is not a part of these documents. Delete all of Sections 11.1, 11.2, 11.3, 11.4, and 11.5, and substitute the following:

INSURANCE REQUIREMENTS FOR NEW CONSTRUCTION, ADDITIONS AND RENOVATIONS

11.1 CONTRACTOR'S LIABILITY INSURANCE

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

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

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

<u>Type of Construction</u>	<u>Projects up to \$1,000,000</u>	<u>Projects over \$1,000,000 up to \$10,000,000</u>	<u>Projects over \$10,000,000</u>
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 is \$_____.		
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

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

11.2.5.2 Flood coverage shall be provided by the Contractor on the first floor and below for all projects, except as otherwise noted. The builder's risk insurance policy, sub-limit for flood coverage shall not be less than ten percent (10%) of the total contract cost per occurrence. If flood is purchased as a separate policy, the limit shall be ten percent (10%) of the total contract cost per occurrence (with a max of \$500,000 if NFIP). Coverage for roofing projects shall **not** require flood coverage.

11.2.5.3 A Specialty Contractor may provide an installation floater in lieu of a Builder's Risk policy, with the similar coverage as the Builder's Risk policy, upon the

system to be installed in an amount equal to the amount of the contract including any amendments. Flood coverage is not required.

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

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

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

11.2.7 Deductibles and Self-Insured Retentions

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

11.3 OTHER INSURANCE PROVISIONS

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

11.3.1.1 Worker's Compensation and Employers Liability Coverage

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

11.3.1.2 Commercial General Liability Coverage

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

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

insurance maintained by the Owner shall be excess and non-contributory of the Contractor's insurance.

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 a State of Louisiana self-insurance or commercial property policy through the Office of Risk Management (ORM), 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 shall select a competent and impartial umpire. The appraisers shall 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 shall 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.

11.3.1.4 All Coverages

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

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

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

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

11.3.2 Acceptability of Insurers

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

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

11.3.3 Verification of Coverage

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

State of Louisiana

Name of Owner

Owner Address

City, State, Zip

Attn: Project # _____

The Owner reserves the right to request complete certified copies of all required insurance policies at any time.

Upon failure of the Contractor to furnish, deliver and maintain required insurance, this contract, at the election of the Agency, may be suspended, discontinued, or terminated. Failure of the Contractor to purchase and/or maintain any required insurance shall not relieve the Contractor from any liability or indemnification under the contract.

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

11.3.4 Subcontractors

Contractor shall include all subcontractors as insureds under its policies OR shall be responsible for verifying and maintaining the certificates provided by each subcontractor. Subcontractors shall be subject to all of the requirements stated herein. The Owner reserves the right to request copies of subcontractor's certificates at any time.

If Contractor does not verify subcontractors' insurance as described above, Owner has the right to withhold payments to the Contractor until the requirements have been met.

11.3.5 Worker's Compensation Indemnity

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

11.3.6 Indemnification/Hold Harmless Agreement

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

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

11.4 PERFORMANCE AND PAYMENT BOND

11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

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

11.4.3 Recordation of Contract and Bond [La R.S. 38:2241 thru 38:2241.1]

The Owner shall record within thirty (30) days the Contract Between Owner and Contractor and Performance and Payment Bond with the Clerk of Court in the Parish in which the Work is to be performed.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.1 Before 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, or 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 non-conforming or warranty Work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming or 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 nonconforming or 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 Section 13.2.2.

13.3 RIGHTS AND REMEDIES

Add the following Section 13.3.3:

13.3.3 The Nineteenth Judicial Court in and for the Parish of East Baton Rouge, State of Louisiana shall have sole jurisdiction and venue in any action brought under this contract.

13.4 TESTS AND INSPECTIONS

In Section 13.4.1, 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 Owner, and the Owner shall bear all related costs of tests, inspections and approvals.

Delete the last two sentences of Section 13.4.1.

13.5 INTEREST

Delete Section 13.5.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

Delete Section 14.1.1.4.

In Section 14.1.3, after the word “profit,” delete the words “on Work not executed” and substitute the following: “for Work completed prior to stoppage”.

14.2 TERMINATION BY THE OWNER FOR CAUSE

Add the following Section:

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.”

Add the following Section:

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

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

In Section 14.4.3, delete all after “incurred by reason of the termination,” and add “along with reasonable profit on the Work not executed.”

ARTICLE 15

CLAIMS AND DISPUTES

15.1 CLAIMS

Delete Section 15.1.2, **Time Limit on Claims**, (See La R.S. 38:2189, and 38:2189.1).

15.1.3.1 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.”

15.1.4.2 In the first sentence of the Section, delete “Initial Decision Maker’s” and replace with “Architect’s”. In the second sentence of the Section, delete “the decision of the Initial Decision Maker” and replace with: “his/her decision”.

Delete Section 15.1.6.2 and substitute the following:

15.1.6.2 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. No additional adverse weather days shall be granted after the original or extended contract completion date, except those adverse weather days associated with a National Weather Service named storm or federally declared weather related disaster directly affecting the project site.

Add the following Section:

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

January	<u>11</u> days	July	<u>6</u> days
February	<u>10</u> days	August	<u>5</u> days
March	<u>8</u> days	September	<u>4</u> days
April	<u>7</u> days	October	<u>3</u> days
May	<u>5</u> days	November	<u>5</u> days
June	<u>6</u> days	December	<u>8</u> days

The Contractor shall ask for total adverse weather days. 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".

At the end of the third sentence, add: "arising prior to the date final payment is due".

Delete the fourth sentence.

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 decision or suggest a compromise or both".

Delete Section 15.2.6.

Delete Section 15.2.6.1.

15.3 MEDIATION

Delete Section 15.3.

15.4 ARBITRATION

Delete Section 15.4.

R-1 ROOFING GUARANTEE
(Roofing Contractor is Sub to G.C.)

OWNER: STATE OF LOUISIANA

ADDRESS: OFFICE OF FACILITY PLANNING AND CONTROL
POST OFFICE BOX 94095 CAPITOL STATION
BATON ROUGE, LOUISIANA 70804-9095

Whereas _____

Address _____

Telephone (_____) _____ Email _____

herein called the "Roofing Contractor", has performed roofing and flashing in accordance with the Contract Documents for Project No. & WBS _____
(hereinafter called the "Work") under a

Subcontract with _____

General Contractor on the Following Project: _____

Name of Project: _____

User Agency: _____

Location/Address: _____

Name and Type of Building(s): _____ State I.D. _____

Type(s) of Roof Deck(s): _____

Total Roof Area: _____ SF; Metal Edge Flashing: _____ LF

Date of Acceptance: _____ Guarantee Period: 2 Years

Date of Expiration: _____

AND WHEREAS the Roofing Contractor has contracted (as a Subcontractor) to guarantee said work against water entry from faulty or defective materials and workmanship for the designated Guarantee period of TWO (2) YEARS from the Acceptance Date of the Project;

AND WHEREAS the General Contractor, by its acceptance of the Contract for the above described project, has jointly assumed with the Roofing Contractor the obligations to the Owner of said guarantee against leaks and faulty or defective materials and workmanship;

NOW THEREFORE the Roofing Contractor and the General Contractor jointly and severally guarantee, subject to the terms and conditions herein set forth, that during the Guarantee Period they will at their own cost and expense, make or cause to be made with approved procedures and materials such repairs to or replacements

February 2026

Roofing Guarantee R-1

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Proj No. & WBS: _____

of said work resulting from water entry or faults or defects of said Work as are necessary to correct faulty and defective work and as are necessary to maintain said Work in watertight conditions and further to respond on or within two (2) working days upon written notification of leaks or defects by the Owner/User Agency. Furthermore, they will at their own cost and expense maintain the roof for (2) years after acceptance, in accordance with the current edition of the Roof Maintenance Manual published by the Roofing Industry Educational Institute. The roof shall be inspected a minimum of twice each year, and a report prepared documenting the conditions observed at each inspection. These inspections shall be made once during the months of April or May and once during the months of September and October. Two copies of each report shall be forwarded to the Owner and User Agency.

This Guarantee is made subject to the following terms and conditions:

1. Damage to the roof caused by the following items are excluded from this warranty: wind exceeding 73 mph, lightning, hail, fire or physical damage from falling or wind-blown objects. When the Work has been damaged by any of the foregoing causes, the Guarantee will be null and void until such damage has been repaired by the Roofing Contractor, and until the cost and expense thereof has been paid by the Owner or another responsible party so designated.
2. During the Guarantee Period, if the Owner/User Agency allows alteration of the Work by anyone other than a Contractor approved in writing by the Roofing Subcontractor, General Contractor, and Roofing Material Manufacturer prior to the work being performed, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the Owner/User Agency engages the Roofing Contractor to perform said alterations, the Guarantee shall not become null and void, unless the Roofing Contractor, prior to proceeding with said work, shall have notified the Owner/User Agency in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the Work, thereby reasonably justifying a termination of this Guarantee.
3. During the Guarantee Period, if the original use of the roof is changed and it becomes used for, but for which it was not originally designed or specified, as a promenade, work deck, spray-cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
4. During the Guarantee Period, if any building or area of a building is changed to uses creating extremes of interior temperature and/or humidity, but for which it was not originally designed and specified, without provisions and alterations made to the building which effectively contain or control these conditions, this guarantee shall become null and void upon the date of said change.
5. The Owner/User Agency shall promptly notify the Roofing Contractor in writing of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the Roofing Contractor to inspect the Work, and to examine the evidence of such leaks, defects or deterioration.
6. This Guarantee is recognized to be the only guarantee of the General and Roofing Contractor on said work, and shall not operate to restrict or cut off the Owner from other remedies and recourses lawfully available to him in case of roofing failure. Specifically, this Guarantee shall not operate to relieve the Roofing Contractor of his responsibility for performance of the original work, regardless of whether the Contract was a Contract directly with the Owner or a Subcontract with the Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this _____
day of _____, 20____.

February 2026

Roofing Guarantee R-1

Page 2 of 3

Proj No. & WBS: _____

Roofing Contractor's Signature: _____

Typed Name: _____

Representing: _____

Telephone (_____) _____ Email _____

Witness: _____ Witness: _____

And has been countersigned by the General Contractor issuing the Roofing Contractor's Subcontract for said work:

Name of General Contractor: _____

Date: _____ Authorized Signature: _____

Typed Name: _____

Representing: _____

Telephone (_____) _____ Email _____

Witness: _____ Witness: _____

R-2 ROOFING GUARANTEE
(Roofer is the Prime Contractor)

OWNER: STATE OF LOUISIANA

ADDRESS: OFFICE OF FACILITY PLANNING AND CONTROL
POST OFFICE BOX 94095 CAPITOL STATION
BATON ROUGE, LOUISIANA 70804-9095

Whereas _____

Address _____

Telephone (_____) _____ Email _____

herein called the "Roofing Contractor", has performed roofing and flashing in accordance with the Contract Documents for Project No. & WBS _____
(hereinafter called the "Work") under a Contract with the Owner.

Name of Project: _____

Project No. & WBS: _____

User Agency: _____

Location/Address: _____

Name and Type of Building(s): _____ State I.D. _____

Type(s) of Roof Deck(s): _____

Total Roof Area: _____ SF; Metal Edge Flashing: _____ LF

Date of Acceptance: _____ Guarantee Period: 2 Years

Date of Expiration: _____

AND WHEREAS the Roofing Contractor has contracted to guarantee said work against water entry from faulty or defective materials and workmanship for the designated Guarantee period of TWO (2) YEARS from the Acceptance Date of the Project;

NOW THEREFORE the Roofing Contractor as the General Contractor guarantees, subject to the terms and conditions herein set forth, that during the Guarantee Period he will at his own cost and expense, make or cause to be made with approved procedures and materials such repairs to or replacements of said work resulting from water entry or faults or defects of said Work as are necessary to correct faulty and defective work and as are necessary to maintain said Work in watertight conditions and further to respond on or within two (2) working days, upon written notification of leaks or defects by the Owner/User Agency. Furthermore, he will at his own cost and expense maintain the roof for (2) years after acceptance, in accordance with the current edition of the Roof Maintenance Manual published by the Roofing Industry Educational Institute. The roof shall be inspected

a minimum of twice each year, and a report prepared documenting the conditions observed at each inspection. These inspections shall be made once during the months of April or May and once during the months of September and October. Two copies of each report shall be forwarded to the Owner and User Agency.

This Guarantee is made subject to the following terms and conditions:

1. Damage to the roof caused by the following items are excluded from this warranty: wind exceeding 73 mph, lightning, hail, fire or physical damage from falling or wind-blown objects. When the Work has been damaged by any of the foregoing causes, the Guarantee will be null and void until such damage has been repaired by the Roofing Contractor, and until the cost and expense thereof has been paid by the Owner or another responsible party so designated.
2. During the Guarantee Period, if the Owner/User Agency allows alteration of the Work by anyone other than a Contractor approved in writing by the Roofing Subcontractor, General Contractor, and Roofing Material Manufacturer prior to the work being performed, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the Owner/User Agency engages the Roofing Contractor to perform said alterations, the Guarantee shall not become null and void, unless the Roofing Contractor, prior to proceeding with said work, shall have notified the Owner/User Agency in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the Work, thereby reasonably justifying a termination of this Guarantee.
3. During the Guarantee Period, if the original use of the roof is changed and it becomes used for, but for which it was not originally designed or specified, as a promenade, work deck, spray-cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
4. During the Guarantee Period, if any building or area of a building is changed to uses creating extremes of interior temperature and/or humidity, but for which it was not originally designed and specified, without provisions and alterations made to the building which effectively contain or control these conditions, this Guarantee shall become null and void upon the date of said change.
5. The Owner/User Agency shall promptly notify the Roofing Contractor in writing of observed, known or suspected leaks, defects or deterioration and shall afford reasonable opportunity for the Roofing Contractor to inspect the Work, and to examine the evidence of such leaks, defects or deterioration.
6. This Guarantee is recognized to be the only guarantee of the General and Roofing Contractor on said work, and shall not operate to restrict or cut off the Owner from other remedies and recourses lawfully available to him in case of roofing failure. Specifically, this Guarantee shall not operate to relieve the Roofing Contractor of his responsibility for performance of the original work, regardless of whether the Contract was a Contract directly with the Owner or a Subcontract with the Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed

this _____ day of _____, 20____.

Roofing Contractor's Signature: _____

Typed Name: _____

Representing: _____

Telephone (_____) _____ Email _____

Witness: _____ Witness: _____

R-3 ROOFING GUARANTEE (Metal)

OWNER: STATE OF LOUISIANA OFFICE OF FACILITY PLANNING AND CONTROL
POST OFFICE BOX 94095 CAPITOL STATION
BATON ROUGE, LOUISIANA 70804-9095

Whereas _____

Address _____

Telephone (_____) _____ Email _____

herein called the Contractor, has provided pre-formed, pre-finished metal roofing, flashing, accessories and miscellaneous items required for a complete roof system installation in accordance with the Contract Documents for the PROJECT:

Name of Project: _____

Project No. & WBS: _____

User Agency: _____

Location/Address: _____

Name and Type of Building(s): _____ State I.D. _____

Type of System: (Standing Seam, Flat Seam, etc.) _____

Total Roof Area: _____ SF; Total Length of Ridge _____ LF

Total Length of Valley: _____ LF; Total Length of gutter/fascia trim: _____ LF

Date of Acceptance _____ Two year Guarantee Expiration _____

AND WHEREAS the Contractor has contracted to guarantee said work against water entry from faulty or defective materials and workmanship for the designated Guarantee period of TWO (2) YEARS from the Acceptance Date of the Project;

NOW THEREFORE the Contractor guarantees, subject to the terms and conditions herein set forth, that during the Guarantee Period the Contractor will at his own cost and expense, make or cause to be made with approved procedures and materials such repairs to or replacements of said work (including any wetted thermal insulation) resulting from water entry or faults or defects of said Work as are necessary to maintain said Work in watertight conditions and further, respond on or within TWO (2) working days upon written notification of leaks or defects by the Owner/User Agency.

This Guarantee is made subject to the following terms and conditions:

1. Damage to the roof caused by the following items are excluded from this warranty: wind exceeding 73 mph, lightning, hail, fire or physical damage from falling or wind-blown objects. When the Work has been damaged by any of the foregoing causes, the Guarantee will be null and void until such damage has been repaired by the Roofing Contractor, and until the cost and expense thereof has been paid by the Owner or another responsible party so designated.

2. During the Guarantee Period, if the Owner/ User Agency allows alteration of the Work by anyone other than a Contractor approved in writing by the original Contractor and/or Roofing Material Supplier prior to the work being performed, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything (i.e. signs) onto the roof, this Guarantee shall become null and void as of the date of said alterations. If the Owner/ User Agency engages the original Contractor for said alterations, the Guarantee shall be maintained in force unless the Contractor presents written notification to the Owner that the intended work will likely damage or cause deterioration of the base work, thereby justifying a termination of the original Guarantee.
3. The Owner/User Agency shall promptly notify the Contractor in writing of observed, known or suspected leaks, defects, or condition deterioration and shall afford a reasonable opportunity for the Contractor to inspect the work and examine evidence of such leaks, defects or deterioration.
4. This Guarantee is recognized to be the only guarantee of the Contractor of said work, and shall not operate to restrict or cut-off the Owner from any other remedies and recourse lawfully available to him in case of roofing failure to any cause or degree. Specifically, this Guarantee shall not operate to relieve the Contractor of his responsibility for the performance of the original work.

IN WITNESS THEREOF, this instrument has been duly executed

this _____ day of _____, 20____.

Contractor's Signature: _____

Typed Name: _____

Telephone (_____) _____ Email _____

Witness: _____ Witness: _____

And if applicable, is countersigned by the following Sub Contractor, Installer, or other party (as indicated) who acted as agent or represented the Contractor during the performance of the work:

Countersignee Name: _____
(Type or Print)

Date: _____ Signature: _____

Representing: _____

Address: _____

Telephone (_____) _____ Email _____

Witness: _____ Witness: _____

Facility Planning and Control State of Louisiana

TWENTY (20) YEAR WEATHERTIGHTNESS METAL ROOF SYSTEM - LIMITED WARRANTY

We, ManufacturerName, the manufacturer; warrants to the State of Louisiana herein referenced as "Owner" of the building described below that subject to the terms, conditions, limitations and warranty responsibility stated herein; Manufacturer warrants with no dollar limit (NDL) the undersigned Contractor workmanship and material defects, and will repair any leaks in the Manufacturer roofing system (Roofing System); and further, agrees to make provisions for satisfactorily drying all wetted thermal roof insulation caused by said leak(s), of the installed roof over the life of this **TWENTY (20) YEAR WARRANTY Period from the Acceptance Date of the Project** (as defined in the Contract Documents).

Satisfactory repair of reported leaks shall not serve to extend the term of the original 20-Year Warranty period for either the repair or the entire Roof System, but rather serve to maintain the Roof System weathertightness condition for the entire term of the original warranty.

Neither Manufacturer nor undersigned Contractor makes any other warranty whatever, expressed or implied. All implied warranties of merchantability and all implied warranties of fitness for any particular purpose which exceed or differ from the warranties herein expressed are disclaimed by each and all of said parties and are hereby excluded from this 20-Year Weathertightness Limited Warranty.

In no event shall Manufacturer be held liable for any commercial loss, claims for labor or consequential damages of any other type not specifically referenced herein, whether owner's claim be based in contract, tort, or strict liability.

TERMS, CONDITIONS, LIMITATIONS

1. A "Leak" is defined as water entry into any location where water entry is not specifically planned for. This can include insulation, cornices, attic spaces and other portions of the building assembly. Water entry through fastener holes, all flashings including valley, hip, ridge, closure, rake, wall runner, eave, curb, pipe penetration and other penetration flashings, and the roof panels and seams (side and end) are to be considered "leaks" as pertains to this weathertightness warranty.
2. Owner shall provide Manufacturer with written notice within THIRTY (30) days of discovery of any leaks in the Roof System; after which date, the principal to this warranty shall be expected to respond to said leak report within a period of TEN (10) working days.
 - a) Failure to respond, shall enable the Owner to engage service of "others" to address the problem without jeopardizing Owner's protection under terms of the original warranty.
 - b) Further, by Manufacturer's failure to respond as specified, subjects manufacturer to liability for full reimburse to the Owner for all costs incurred to engage the services of "others" in order to protect the building from further damage by roof leak(s).
 - c) Manufacturer cannot be held responsible for lack of performance or liable under the terms of this warranty due to Owner's failure to report claims as specified.

3. After a leak report is filed; Manufacturer shall determine whether the leak is caused by defects in manufactured material or in the workmanship and affect the Roof System repair in accordance with repair obligations herein. In the event a determination is made that neither defect in manufactured material or workmanship is at fault, the Owner shall be so advised in writing and permitted to exercise other remedies without jeopardy to provisions of the original warranty.
4. This Guarantee is made subject to the following terms and conditions:
 - a) Damage to the roof caused by the following items are excluded from this warranty: wind exceeding 73 mph, lightning, hail, fire or physical damage from falling or wind-blown objects. When the Work has been damaged by any of the foregoing causes, the Guarantee will be null and void until such damage has been repaired by the Roofing Contractor, and until the cost and expense thereof has been paid by the Owner or another responsible party so designated.
 - b) Deterioration caused by marine (salt water) atmosphere or by regular spray of salt or fresh water.
 - c) Corrosion caused by heavy fall out or exposure to corrosive chemicals, ash or fumes from chemical plants, foundries, plating works, kilns, fertilizing manufacture and paper manufacturing plants - if either cause is located less than one-half mile radius distant from the building.
 - d) Deterioration caused by corrosive or condensates generated or released from within the building itself.
 - e) Damages caused by workers or work activity on the roof after issuance of the warranty.
 - f) Structural failures affecting (but not part of) the Roof System.
 - g) Unauthorized alterations or modifications of the Work by anyone other than a Contractor agreed to in writing by all parties to this warranty.
 - h) Failure of the Owner to exercise reasonable care and maintenance.
- a) During the Term of this warranty; and within 72 hours of formal request, the Owner shall permit Manufacturer, or manufacturer's agent access to the roof during regular business hours.
5. Failure of either party to exercise or enforce specific terms, conditions or provisions shall not be construed to be a waiver of same.
6. The Manufacturer shall not be responsible for consequential damage or loss to the building, its contents, or other material as a provision of this warranty.
7. The Manufacturer shall not have any liability or responsibility at any time for, or as a consequence of any condensation or underside corrosion which is or was caused at anytime by any condensation resulting from either or both of the following:
 - a) Inadequate ventilation of the attic space between the roof panel and insulation, when insulation is installed on top of existing roof.
 - b) The use of inadequate vapor barrier where the insulation is installed immediately beneath roof panels.
8. The Nineteenth Judicial Court in and for the Parish of East Baton Rouge, State of Louisiana shall have sole jurisdiction in any action brought as a result of this warranty by any party hereto.
9. This Warranty instrument supersedes and is in lieu of any and all other expressed or implied warranties that are or may be in conflict with terms and conditions stated herein.
10. An executed Warranty is required prior to Acceptance being issued by FP&C for the project.

WARRANTY RESPONSIBILITY

FIRST (1st.) year through the TWENTIETH (20th) year from date of Acceptance of the project by Roof System Manufacturer whose legal entity is Manufacturer; except that the first recourse of the Owner for Warranty Benefits during Year 1 and Year 2 after date of Project Acceptance will be the Contractor per provisions of Roofing Guarantee R-3 (Metal).

EXCEPT AS EXPRESSLY PROVIDED HEREIN, Manufacturer MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO MATERIALS COVERED HEREBY, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, NOR DOES SELLER MAKE ANY WARRANTY OR ASSUME ANY OBLIGATION WITH RESPECT TO THE VALIDITY OF ANY PATENTS, DESIGNS, COPYRIGHTS OR TRADEMARKS WHICH MAY COVER SUCH GOODS EXCEPT; THAT THE OWNER SHALL HAVE THE RIGHT TO RELY ON SAME BY REPRESENTATION OF THE MANUFACTURER THAT BY OFFERING THE MATERIAL, ROOF SYSTEM AND MISCELLANEOUS ITEMS FOR THE PURPOSES OF THIS PROJECT THERE IS NO VIOLATION OF THE RIGHTS OF OTHER PARTIES WITH RESPECT TO PATENTS, DESIGNS, COPYRIGHTS OR TRADEMARKS, FURTHER; THE CONDITIONS OF LIABILITY, RIGHTS, OBLIGATIONS AND REMEDIES OF THE PARTIES RELATING TO CLAIMS ARISING FROM DEFECTIVE GOODS SHALL BE GOVERNED EXCLUSIVELY BY THE TERMS HEREOF: THIS WARRANTY MAY NOT BE CHANGED ORALLY.

IN CONSIDERATION FOR PAYMENT RECEIVED, THIS WARRANTY IS TENDERED FOR THE BENEFIT OF THE OWNER AND IS NOT TRANSFERABLE OR ASSIGNABLE WITHOUT THE WRITTEN CONSENT OF THE MANUFACTURER.

THIS WARRANTY REQUIRES THE ORIGINAL SIGNATURES OF AN OFFICER OF THE MANUFACTURER, AND THREE FULLY EXECUTED COPIES WILL BE PROVIDED TO THE OWNER AS A PREREQUISITE FOR PROJECT ACCEPTANCE. THE OWNER'S SIGNATURE SHALL NOT BE A REQUIREMENT FOR IMPLEMENTATION OF, OR CAUSE TO VALIDATE THE WARRANTY.

A SEPARATE AND INDEPENDENT WARRANTY SHALL BE ISSUED FOR EACH BUILDING OR INDEPENDENT ROOF SYSTEM IN THE CASE OF MULTIPLE BUILDINGS OR MIXED ROOFED PROJECTS.

PROJECT DATA / SIGNATORS

Building/Project Description: _____

Roof Type and Quantity: _____

Location: _____

State I.D. (if Exist. Bldg.): _____

Site Code: _____

State Project No. & WBS: _____

Date of Project Acceptance/Commencement of Warranty: _____ Ends: _____

Manufacturer:

S _____ Title _____ Date: _____

ADDITIONAL PARTIES FOR FILE AND RECORD

File Reference:
Contractor or
Roofing Contractor
Address:

S _____

Title _____ Date: _____

File Reference #2:
Contractor or
Roofing Contractor
Address:

S _____

Title _____ Date: _____

Direct to:

STATE of LOUISIANA (Owner)
DIVISION OF ADMINISTRATION
Facility Planning and Control
Statewide Roofing Program
PO Box 94095
Baton Rouge, Louisiana 70804-9095

**Facility Planning and Control
State of Louisiana**

**TWENTY (20) YEAR
MANUFACTURER'S NDL WATERTIGHTNESS
MEMBRANE
ROOFING SYSTEM WARRANTY**

MFGR. Warranty No. _____

_____, hereinafter referred to as "mfgr" hereby warrants to the owner, known as the State of Louisiana, hereinafter referred to as the "State" that the referenced membrane roofing assembly will remain in a watertight condition for a period of 20 Years. For the purpose of this warranty "watertight" or "watertightness means that the roofing system does not allow water to leak through a breach in the roofing system. Mfgr further warrants the performance of the products listed below and warrants that the material and installation of the roofing assembly is free of material and known installation defects at the time of application and that the materials listed below conform to mfgr specifications.

All products used in the roofing assembly from the deck (structural concrete, metal, LWIC, wood, etc.), up are included in this warranty regardless of whether mfgr furnished or branded the products with the exception of shop fabricated metals not furnished by mfgr. These products are to include, but not be limited to: base sheets, fasteners and plates, insulation board, cover board, asphalt, adhesives (insulation and membrane), mastics, field plies, membrane flashing plies and liquid flashing products. The roofing products are specifically listed as follows:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

In the event that the new membrane roofing assembly is installed in a recover fashion over an existing roofing assembly, the performance of the existing roofing products that remain in-place beneath the new roofing assembly are excluded from this warranty.

In the event that covered leaks occur in the roofing system that are attributable to the workmanship of the installing contractor or a defect in or failure of any of the mfr products listed above, mfr will make repairs required to return the roof to a watertight condition, regardless of the scope and cost of the required repairs. The State will notify mfr within 30 days of the discovery of the leak. Should the State not make this notification within the prescribed 30 day time period, then further damage to the roofing assembly caused by the delay in notification will not be construed as a warranty repair item. Mfr will respond to the leak notification within 10 days and once it is confirmed that the leak(s) is within the scope of mfrs responsibilities under this warranty, mfr will execute repairs promptly thereafter. Mfr's failure to respond timely and make proper repairs shall enable the State to engage service of "others" to address the problem(s) at mfr's expense assuming the cost of the repair is reasonable and the scope of the repair is limited to the remedy of the leak without jeopardizing State's protection under terms of this warranty. The State may make reasonable and customary emergency temporary repairs at its discretion and at mfrs expense without jeopardizing the State's protection under the terms of this warranty.

This Form shall be utilized on the following Roof Systems:

2-Ply SBS, 1-Ply (PVC, TPO) & SPF.

On a **2-Ply SBS Roof System**, the manufacturers and their products previously approved by the State are included in the State's list of acceptable products; these mfrs have agreed to a dimensional stability of the cap sheet and interply sheet of 0.2% per ASTM D 5147, section 10. 0.2% of a 33 foot roll is approximately equal to $\frac{3}{4}$ ". For the term of this warranty, SBS cap sheet shrinkage in excess of $\frac{3}{4}$ " will be repaired by the mfr by cutting out the interply void in the "T" lap, cleaning and drying, and repair with an acceptable cap sheet product.

The following items are excluded from this warranty:

1. Damage to the roof caused by wind exceeding 73 mph, lightning, hail, fire or physical damage from falling or wind-blown objects
2. Deficient design by other than mfr
3. Intentional or accidental damages to the roof, or misuse, abuse, vandalism or the likes
4. Leaks caused by deterioration or failure of items not included in the warranty
5. Modifications or alterations to the roofing assembly after completion unless done in a manner approved by mfr
6. Damage to the roofing assembly after issuance of this warranty caused by excessive foot traffic or its use as a work platform or storage area
7. Damage to the roofing assembly caused by ponding water, which is defined as water on the surface of the roof that does not dissipate within 72 hours of average drying conditions
8. Consequential and incidental damages, including damage to the building or its contents
9. Damage to the roofing assembly caused by failure by the State to exercise reasonable care and maintenance
10. Damage to the roofing assembly caused by structural defects or failure or excessive movement

of building components

11. Damage to the roofing assembly due to exposure to chemical attack, including deposits of animal fats, grease and oil
12. The State shall be responsible for the costs associated with the removal and replacement of any overburden, superstrata or overlays, either permanent or temporary, which include but are not limited to: structures or assemblies added after installation, fixtures or utilities on or through the roofing assembly, support platforms or bases for solar panels, garden roofs, decks, patios or any other obstacles that impede access, clear observation, investigation or repairs to the roofing system, excluding ballast or pavers or any other overburden specifically accepted by mfg to be included within warranty coverage.

For wind related events, this warranty excludes damage to the roofing assembly where the cause includes any of the following:

- A. Failure or excessive movement of primary or secondary structural elements or roof deck, wood nailers or blocking and edge system components not furnished by mfg
- B. Failure of walls, doors, windows, openings or other building envelope components
- C. Rooftop structures and equipment

Mfg may have access to the roof for inspection purposes for the term of the warranty by scheduling through the appropriate State Agency.

This warranty is tendered for the benefit of the State and is not transferable or assignable without the written consent of Mfg.

The Nineteenth Judicial District Court in and for the Parish of East Baton Rouge, State of Louisiana shall have sole jurisdiction in any action brought as a result of this warranty by any party hereto. This warranty shall be governed by and construed in accordance with the laws of the State of Louisiana.

This warranty instrument supersedes and is in lieu of any and all other expressed or implied warranties that are or may be in conflict with terms and conditions stated herein.

This warranty requires the signature of an authorized officer of Mfg. Three fully executed copies are to be provided to the State as a prerequisite for project acceptance. The State's signature shall not be a requirement for implementation of, or cause to validate this warranty.

A separate and independent warranty shall be issued for each building or independent roof system in the case of multiple buildings or mixed roof types.

PROJECT DATA / SIGNATORS

Owner: State of Louisiana – DOA – Facility Planning and Control

Building/Project Name: _____

Roof Type: _____

No. of Squares (100 SF): _____

Location: _____

State I.D. (if Exist. Bldg.): _____

Site Code: _____

State Project No. & WBS: _____

Date of Project Acceptance/Commencement of Warranty: _____ Ends: _____

Manufacturer Information

Mfgr. Name: _____

Mfgr. Address: _____

Mfgr. Phone No.: _____

Authorized Mfgr. Signature:

S _____

Printed Name _____ Date: _____

Title _____

ADDITIONAL PARTIES FOR FILE AND RECORD

File Reference:
Contractor or
Roofing Contractor
Address:

Mfgr. Name: _____

Mfgr. Address: _____

Mfgr. Phone No.: _____

File Reference #2:
Contractor or
Roofing Contractor
Address:

Mfgr. Name: _____

Mfgr. Address: _____

Mfgr. Phone No.: _____

Direct to:

STATE of LOUISIANA (Owner)
DIVISION OF ADMINISTRATION
Facility Planning and Control
Statewide Roofing Program
PO Box 94095
Baton Rouge, Louisiana 70804-9095

SCHEDULE OF VALUES

The Contractor is to use the following format. The total Contract Cost is to be itemized in each Subsection listed (as applicable)

DIVISION 01 – GENERAL REQUIREMENTS	Quantity	Cost
01 00 00 General Requirements	_____	_____
01 32 50 Record Drawings, Shop Drawings, Product Data, Samples and other submittals.	_____	_____
	TOTAL	_____
DIVISION 02 – EXISTING CONDITIONS		
02 30 00 Subsurface Investigation	_____	_____
02 41 00 Demolition	_____	_____
	TOTAL	_____
DIVISION 03 – CONCRETE		
03 01 00 Maintenance of Concrete	_____	_____
03 11 00 Concrete Forming	_____	_____
03 15 00 Concrete Accessories	_____	_____
03 20 00 Concrete Reinforcing	_____	_____
03 30 00 Cast-in-place Concrete	_____	_____
03 40 00 Precast Concrete	_____	_____
03 50 00 Cast Decks & Underlayment	TOTAL	_____
DIVISION 04 – MASONRY		
04 01 00 Maintenance of Masonry	_____	_____
04 05 13 Masonry Mortaring	_____	_____
04 05 19 Masonry Anchorage & Reinforcing	_____	_____
04 05 23 Masonry Accessories	_____	_____
04 20 00 Unit Masonry	TOTAL	_____
DIVISION 05 – METALS		
05 05 23 Metal Fastenings	_____	_____
05 10 00 Structural Metal Framing	_____	_____
05 20 00 Metal Joists	_____	_____
05 30 00 Metal Decking	_____	_____
05 50 00 Metal Fabrications	_____	_____
05 58 00 Formed Metal Fabrications	TOTAL	_____
DIVISION 06 – WOOD, PLASTICS, & COMPOSITES		
06 05 23 Fastening and Adhesives	_____	_____
06 10 00 Rough Carpentry	_____	_____
06 13 00 Heavy Timber	_____	_____
06 17 00 Shop-fabricated Structural Wood	_____	_____
06 20 00 Finish Carpentry	SUB-TOTAL	_____

DISISION 06 – WOOD, PLASTICS, &
COMPOSITES (CONTINUES)

06 40 00	Architectural Woodwork	_____	_____
06 60 00	Plastic Fabrications	_____	_____
06 80 00	Composite Fabrications	_____	_____
	TOTAL		_____

DIVISION 07 – THERMAL AND MOISTURE
PROTECTION

07 10 00	Dampproofing and Waterproofing	_____	_____
07 18 00	Traffic Coatings	_____	_____
07 19 00	Water Repellents	_____	_____
07 21 00	Thermal Insulation	_____	_____
07 24 00	Exterior Insulation & Finish Systems	_____	_____
07 25 00	Weather Barriers	_____	_____
07 31 00	Shingles and Shakes	_____	_____
07 32 00	Roof Tiles	_____	_____
07 40 00	Roofing and Siding Panels	_____	_____
07 50 00	Membrane Roofing	_____	_____
07 60 00	Flashing and Sheet Metal	_____	_____
07 61 00	Sheet Metal Roofing	_____	_____
07 70 00	Roof & Wall Specialties and Accessories	_____	_____
07 80 00	Fire and Smoke Protection	_____	_____
07 90 00	Joint Protection	_____	_____
07 95 00	Expansion Control	_____	_____
	TOTAL		_____

DIVISION 08 – OPENINGS

08 11 00	Metal Doors and Frames	_____	_____
08 14 00	Wood Doors	_____	_____
08 15 00	Plastic Doors	_____	_____
08 30 00	Specialty Doors and Frames	_____	_____
08 41 00	Entrances and Storefronts	_____	_____
08 44 00	Curtain Wall and Glazed Assemblies	_____	_____
08 51 00	Metal Windows	_____	_____
08 52 00	Wood Windows	_____	_____
08 53 00	Plastic Windows	_____	_____
08 56 00	Special Function Windows	_____	_____
08 60 00	Roof Windows and Skylights	_____	_____
08 70 00	Hardware	_____	_____
08 80 00	Glazing	_____	_____
08 90 00	Louvers and Vents	_____	_____
	TOTAL		_____

DIVISION 09 – FINISHES

09 22 00	Supports for Plaster and Gypsum Board	_____	_____
09 23 00	Gypsum Plastering	_____	_____
09 24 00	Portland Cement Plastering	_____	_____
09 29 00	Gypsum Board	_____	_____
09 30 00	Tiling	_____	_____
	SUB-TOTAL		_____

DIVISION 09 – FINISHES (CONTINUED)

09 50 00	Acoustical Ceilings	_____	_____
09 54 00	Specialty Ceilings	_____	_____
	Quantity	_____	_____
09 61 00	Flooring Treatment	_____	_____
09 62 00	Specialty Flooring	_____	_____
09 63 00	Masonry Flooring	_____	_____
09 64 00	Wood Flooring	_____	_____
09 65 00	Resilient Flooring	_____	_____
09 66 00	Terrazzo Flooring	_____	_____
09 68 00	Carpeting	_____	_____
09 69 00	Access Flooring	_____	_____
09 97 00	Wall Finishes	_____	_____
09 91 00	Painting	_____	_____
09 97 00	Special Coatings	_____	_____
	TOTAL	_____	_____

DIVISION 10 – SPECIALTIES

10 11 00	Visual Display Surfaces	_____	_____
10 14 00	Signage	_____	_____
10 21 00	Compartments and Cubicles	_____	_____
10 22 00	Partitions	_____	_____
10 26 00	Wall and Door Protection	_____	_____
10 28 00	Toilet, Bath, and Laundry Accessories	_____	_____
10 44 00	Fire Protection Specialties	_____	_____
10 51 00	Lockers	_____	_____
10 56 00	Storage Assemblies	_____	_____
10 82 00	Grilles and Screens	_____	_____
	TOTAL	_____	_____

DIVISION 11 – EQUIPMENT

11 15 00	Security, Detention, and Banking Equipment	_____	_____
11 19 00	Detention Equipment	_____	_____
11 23 00	Commercial Laundry and	_____	_____
	Dry Cleaning Equipment	_____	_____
11 26 00	Unit Kitchens	_____	_____
11 27 00	Photographic Processing Equipment	_____	_____
11 40 00	Foodservice Equipment	_____	_____
11 51 00	Library Equipment	_____	_____
11 52 00	Audio-Visual Equipment	_____	_____
11 53 00	Laboratory Equipment	_____	_____
11 61 00	Theater and Stage Equipment	_____	_____
11 65 00	Athletic and Recreational Equipment	_____	_____
11 70 00	Healthcare Equipment	_____	_____
	TOTAL	_____	_____

DIVISION 12 – FURNISHINGS

12 20 00	Window Treatments	_____	_____
12 30 00	Casework	_____	_____
12 40 00	Furnishings and Accessories	_____	_____
12 50 00	Furniture	_____	_____
	TOTAL	_____	_____

DIVISION 13 – SPECIAL CONSTRUCTION

13 10 00	Special Facility Components	_____	_____
13 34 00	Fabricated Engineered Structures	_____	_____
13 49 00	Radiation Protection	_____	_____
	TOTAL	_____	_____

DIVISION 14 – CONVEYING EQUIPMENT

14 20 00	Elevators	_____	_____
14 30 00	Escalators and Moving Walks	_____	_____
14 40 00	Lifts	_____	_____
14 80 00	Scaffolding	_____	_____
	TOTAL	_____	_____

DIVISION 21 – FIRE SUPPRESSION

21 10 00	Water-Based Fire-Suppression Systems		
	Piping	_____	_____
21 20 00	Fire-Extinguishing Systems	_____	_____
21 30 00	Fire Pumps	_____	_____
	TOTAL	_____	_____

DIVISION 22 – PLUMBING

22 07 00	Plumbing Insulation	_____	_____
22 11 00	Facility Water Distribution	_____	_____
22 13 00	Facility Sanitary Sewerage	_____	_____
22 14 00	Facility Storm Drainage	_____	_____
22 30 00	Plumbing Equipment	_____	_____
22 40 00	Plumbing Fixtures	_____	_____
	TOTAL	_____	_____

DIVISION 23 – HEATING, VENTILATING, & AIR-
CONDITIONING

23 05 93	Testing, Adjusting, & Balancing for HVAC	_____	_____
23 07 00	HVAC Insulation	_____	_____
23 09 00	Instrumentation & Control for HVAC	_____	_____
23 13 00	Facility Fuel-Storage Tanks	_____	_____
23 20 00	HVAC Piping and Pumps	_____	_____
23 30 00	HVAC Air Distribution	_____	_____
23 40 00	HVAC Air Cleaning Devices	_____	_____
23 50 00	Central Heating Equipment	_____	_____
23 60 00	Central Cooling Equipment	_____	_____
23 70 00	Central HVAC Equipment	_____	_____
	TOTAL	_____	_____

DIVISION 26 – ELECTRICAL

26 09 00	Instrumentation & Control for Electrical Systems	_____	_____
26 10 00	Medium-Voltage Electrical Distribution	_____	_____
26 20 00	Low-Voltage Electrical Transmission	_____	_____
26 27 00	Low-Voltage Distribution Equipment	_____	_____
26 30 00	Facility Electrical Power Generating & Storage Equipment	_____	_____
26 40 00	Electrical and Cathodic Protection	_____	_____
26 50 00	Lighting	_____	_____
	TOTAL	_____	_____

DIVISION 27 – COMMUNICATIONS

27 10 00	Structured Cabling	_____	_____
27 20 00	Data Communications	_____	_____
27 30 00	Voice Communications	_____	_____
27 40 00	Audio-Video Communications	_____	_____
27 50 00	Distributed Communications & Monitoring Systems	_____	_____
		TOTAL	_____

DIVISION 28 – ELECTRONIC SAFETY AND
SECURITY

28 10 00	Electronic Access Control & Intrusion Detection	_____	_____
28 20 00	Electronic Surveillance	_____	_____
28 30 00	Electronic Detection and Alarm	_____	_____
28 40 00	Electronic Monitoring and Control	_____	_____
		TOTAL	_____

DIVISION 31 – EARTHWORK

31 10 00	Site Clearing	_____	_____
31 20 00	Earth Moving	_____	_____
31 31 00	Soil Treatment	_____	_____
31 32 00	Soil Stabilization	_____	_____
31 40 00	Shoring and Underpinning	_____	_____
31 50 00	Excavation Support and Protection	_____	_____
31 60 00	Special Foundations and Load- Bearing Elements	_____	_____
		TOTAL	_____

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 10 00	Bases, Ballasts, and Paving	_____	_____
32 30 00	Site Improvements	_____	_____
32 90 00	Planting	_____	_____
		TOTAL	_____

DIVISION 33 – UTILITIES

33 10 00	Water Utilities	_____	_____
33 30 00	Sanitary Sewerage Utilities	_____	_____
33 40 00	Storm Drainage Utilities	_____	_____
33 50 00	Fuel Distribution Utilities	_____	_____
33 60 00	Hydronic & Steam Energy Utilities	_____	_____
33 70 00	Electrical Utilities	_____	_____
33 80 00	Communications Utilities	_____	_____
		TOTAL	_____

DIVISION 34 – TRANSPORTATION

34 00 00	Transportation	_____	_____
		TOTAL	_____

DIVISION 35 – WATERWAY AND MARINE
CONSTRUCTIONS

35 00 00	Waterway and Marine construction	_____	_____
		TOTAL	_____

DIVISION 40-43 – PROCESS EQUIPMENT

DIVISION 44 – POLLUTION CONTROL
EQUIPMENT

44 40 00	Water Treatment Equipment	_____	_____
44 41 00	Packaged Water Treatment Plants	_____	_____
44 50 00	Solid Waste Control	_____	_____
		TOTAL	_____

DIVISION 45 – INDUSTRY SPECIFIC
MANUFACTURING
EQUIPMENT

DIVISION 48 – ELECTRICAL POWER
GENERATION

48 10 00	Electrical Power Generation Equipment	_____	_____
48 70 00	Electrical Power Generation Testing	_____	_____
		TOTAL	_____

Facility Planning & Control
CHANGE ORDER

PROJECT NAME: _____
PROJECT & WBS No: _____
CONTRACTOR: _____
SITE CODE: _____ STATE ID: _____

CHANGE ORDER No. _____

CONTRACT DATE: _____
NTP DATE: _____
SRM No.: _____

BREAKDOWN forms as required and give a brief description of each change below, including RFI No., cost and days from Summary Pages.

The Original Contract Sum _____
Total Changes by Previous Change Order(s) _____
Current Contract Sum _____
Contract Sum will be ☐ unchanged ☐ increased by ☐ decreased by: _____
New Contract Sum _____

The Original Contract Completion Date and Contract Time. Date: _____ DAYS
Total Time extended by Previous Change Order(s) _____ DAYS
Contract Time will be ☐ unchanged ☐ increased by ☐ decreased by: _____ DAYS
New Contract Completion Date & Contract Time Date: _____ DAYS
Added Building Area _____ (Sq. Ft.)

NOTE: No additional increase in time or money will be considered for a Change Order item after it has been executed.

RECOMMENDED

Designer's Name: _____

ACCEPTED

Contractor's Name: _____

APPROVED

Project Manager: _____

Address: _____ Address: _____ Facility Planning & Control

Email Address: _____ Email Address: _____

By: _____ By: _____

Date: _____ Date: _____

By: _____

Date: _____

FACILITY PLANNING AND CONTROL USE ONLY

Classification	Amount	Classification	Amount
Omission (Type "O")*	_____	Miscellaneous (Type "M")	_____
Error (Type "E")*	_____	Owner Requested (Type "R")	_____
COMMENTS:	Senior Manager/Assistant Director approval: _____		

Construction Contract Change Order
SUMMARY

State of Louisiana

Facility Planning & Control

Project & WBS No. _____

Item No. _____

RFI No. (or COR, CPR, etc.) _____

Date: _____

Project Name: _____

Contractor Name: _____

Description of Work:

General Contractor Direct Costs - Breakdown No. _____

(See attached breakdown)

Total General Contractor Cost

(General Contract Direct Cost plus OH&P)

_____%
(Max: 8%)

Subcontractor Cost Breakdowns

(See attached.)

Subcontractor Name	Breakdown No.	A Total Direct Cost	B OH&P (Max 8%)	C Total A+(A X B)
			_____%	
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____
_____	_____	_____	_____%	_____

Subcontractor Direct Costs Total

(Sum column A)

Subcontractor Direct Costs + Subcontractor OH&P

(Sum column C)

General Contractor OH&P on Subcontractor Direct Cost at

(Sum column A times General Contractor OH&P rate.)

_____%
(Max: 8%) _____

Total Subcontractor Costs

(Subcontractor Direct Costs + OH&P + General Contractor OH&P)

Change Order Subtotal

(Sum of Total General Contractor Costs and Total Subcontractor Costs)

Performance and Payment Bond at

(Change Order Subtotal times Performance and Payment Bond rate)

_____%

Amount will be ☐ increased by ☐ decreased by ☐ unchanged

(Sum of Change Order Subtotal and Performance and Payment Bond)

Days will be ☐ increased by ☐ decreased by ☐ unchanged

(Attach supporting data such as meteorological reports)

Construction Contract Change Order

BREAKDOWN

Breakdown No. _____

State of Louisiana

Item No. _____

Facility Planning & Control

RFI No. (or COR, CPR, etc.) _____

Project & WBS No. _____

Date: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Direct Cost of Work :

A. Labor

Check here if explained on the Comment Sheet



Hourly Wage Rate

Hours

Total Cost

1	☐			
2	☐			
3	☐			
4	☐			
5	☐			
6	☐			
7	☐			

Sub Total

Add Labor Burden @ _____ %

LABOR TOTAL**B. Material**

Unit Price

Unit

Units

Total Cost

1	☐			
2	☐			
3	☐			
4	☐			
5	☐			
6	☐			
7	☐			

(Copies of invoices may be required.)

Sub Total

Add Tax @ _____ %

MATERIAL TOTAL**C. Equipment**

Unit Rate

Unit

Units

Total Cost

1	☐			
2	☐			
3	☐			
4	☐			
5	☐			
6	☐			
7	☐			

(Copies of invoices may be required.)

Sub Total

Add Tax @ _____ %

EQUIPMENT TOTAL

TOTAL DIRECT COST FOR THIS BREAKDOWN:

(Sum A, B & C)

Construction Contract Change Order
BREAKDOWN COMMENT SHEET

State of Louisiana

Facility Planning & Control

Project & WBS No. _____

Breakdown No. _____

Item No. _____

RFI No. (or COR, CPR, etc.) _____

Date: _____

Project Name: _____

Contractor/Subcontractor: _____

A. Labor

No. (From BREAKDOWN Sheet)

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Material

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

C. Equipment

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Construction Contract Change Order

UNIT PRICE BREAKDOWN

State of Louisiana

Facility Planning & Control

Project & WBS No. _____

Breakdown No. _____

Item No. _____

RFI No. (or COR, CPR, etc.) _____

Date: _____

Project Name: _____

Contractor/Subcontractor: _____

Unit Price Tabulation

(Unit prices must be included in the bid or clearly defined in a standard, industry recognized pricing reference. The pricing reference shall be identified herein.)

Unit Price Description	Reference*	Unit Price	Units	Total
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

* Reference Legend: _____

Unit Price Total:

(Sum Total column)

State of Louisiana
Division of Administration
Facility Planning and Control
Instructions for Change Order Back Up Forms

The General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition, and the Supplementary Conditions provide for changes in the contract in the form of change orders. The costs of such changes must be carefully, clearly and accurately documented. Facility Planning & Control has prepared a set of forms to be used to provide this documentation in a consistent format that is in accordance with the Contract Documents.

Change orders will typically contain one or more items of work. Each item of work will typically include work by the general contractor and/or one or more subcontractors. The documentation begins with a breakdown of the work of the contractor and each subcontractor. This is prepared using the form entitled "BREAKDOWN." One form for the General Contractor and one for each subcontractor. Each breakdown will be summarized on the form entitled "SUMMARY." Each item of work will, in turn, be summarized on the change order itself. This should be on the face of the change order.

The forms are available as a Microsoft Excel worksheet for ease of preparation, with formulas established for mark-ups and other basic mathematical operations.

These forms are to be used as provided. Any alteration to the forms may cause the change order to be rejected.

GENERAL: (Refer to Article 7 of the Supplementary and General Conditions)

Forms - There are five forms to be used for all Facility Planning and Control change orders: CHANGE ORDER form, SUMMARY, BREAKDOWN, BREAKDOWN COMMENT SHEET and UNIT PRICE BREAKDOWN. The CHANGE ORDER form is the highest level and is the official, signed document. A CHANGE ORDER form may include one or more items of work, each of which is backed up by a SUMMARY. Each SUMMARY will be backed up with one or more BREAKDOWNs. Any unusual rates, unit costs or quantities may be explained on the COMMENT SHEET. It's simple. The BREAKDOWN form must be used for the general contractor and any subcontractor, at any level, that is to get OH&P. Use as many as needed.

Unit Pricing - Labor, material and equipment breakdown is the standard method of pricing change orders for Facility Planning and Control. However, unit pricing may be considered in some circumstances if the unit prices are clearly established such as by unit prices that were included in the bid. These prices may also be derived from a construction industry standard reference such as R.S. Means. If unit prices were included in the bid they are acceptable for pricing change order work and, in fact, must be used for any work that is included in the change order for which they were established. The UNIT PRICE BREAKDOWN is provided for this purpose.

CHANGE ORDER:

Project identification information: Complete as required. The Site Code, State ID and SRM No(s). (contract numbers) can be obtained from the FP&C Project Manager.

Description: This will include a list of each attached SUMMARY that makes up this change order and a brief statement of the work included in each, including RFI No., cost and days from the SUMMARY page.

New Contract Sum: Calculate the new contract amount using the original contract amount, previous change orders and the new change order. Indicate the appropriate word for increase, decrease or unchanged by selecting the appropriate checkbox.

New Contract Completion Date and Revised Time: Calculate the new contract time using the original Contract Completion Date and Contract Time, previous changes in time and the change in time by this change order. Indicate the appropriate word for increase, decrease or unchanged by selecting the appropriate checkbox. Show days in the main column and the date in the blank indicated.

Added Building Area: Show any building area added by this change order. If none, enter "None."

RECOMMENDED: Show the Designer's name and address, sign on the line indicated as "By:" and date on the indicated line.

ACCEPTED: Show the Contractor's name and address, sign on the line indicated as "By:" and date on the indicated line.

APPROVED: For approval by FP&C.

SUMMARY: (Refer to Article 7 of the Supplementary and General Conditions)

Item No.: Show the Item number as it will appear on the CHANGE ORDER Form. Note: This may be one of several items included in one CHANGE ORDER form.

RFI No.: Show the number of the request for information. This may be known by another name such as COR (Change Order Request,) CPR (Change Proposal Request,) etc.

Project No., WBS No., Date, Project Name. Will auto-fill from information entered on the first tab.

Contractor: Name of General Contractor. Will auto-fill from information entered on the first tab.

Description of Work: Give a brief description of the work included in this **Item**.

General Contractor Direct Costs: Show the total General Contractor Cost from the BREAKDOWN and show the Breakdown No. in the space provided.

General Contractor Total Cost: Show the total General Contractor Cost plus the General Contractor's overhead and profit. The overhead and profit shall not exceed 8% of the Direct Cost.

Subcontractor Cost Breakdowns: List each subcontractor, Breakdown No. and Total Direct Cost (in column "A") from the attached BREAKDOWN sheets. Show the subcontractor's overhead and profit percentage in column "B" and show the calculated total of the direct cost plus the percentage of the direct cost in column "C." If the electronic version of the form is being used, column "C" will be automatically calculated. The overhead and profit shall not exceed 8% of the Total Direct Cost.

Subcontractor Direct Costs Total: Sum of column "A." This will be used to calculate the General Contractor's overhead and profit on the subcontractors' work. If the electronic version is being used, this will be an automatic calculation.

Subcontractor Direct Costs + Subcontractor OH&P: Sum of column "C." This represents the total amount that subcontractors will be paid. Automatic calculation.

General Contractor OH&P on Subcontractor Direct Cost at ____%. The contractors overhead and profit on the subcontractors' direct cost (without subcontractor OH&P.) Enter the percentage of the contractor's OH&P on the subcontractors' work (not to exceed 8%) and show the calculated total of the subcontractors' direct cost plus the percentage of the direct cost in the space. Automatic calculation.

Total Subcontractor Costs: Total of the last two spaces.

Change Order Subtotal: Total of change order except bond.

Performance and Payment Bond at ____%: Enter bond percentage (from amount provided by the contractor at the Pre-Construction Conference) and calculate the amount for the bond.

Amount will be (increased) (decreased) (unchanged) by: Add bond and calculate total change order amount. Indicate "increase," "decrease" or "unchanged" by checking the appropriate box.

Days will be (increased) (decreased) (unchanged) by: Show the number of days to be added or deleted from the contract, if any, due to changes in scope, adverse weather, unusual delays or other factors, **only** if it is proven the critical path is affected. Note that a change in scope does not necessarily indicate a change in time. Indicate "increased," "decreased" or "unchanged" by checking the appropriate box.

BREAKDOWN:

Item No. Show the Item number as it will appear on the CHANGE ORDER Form and the SUMMARY.

Note: This may be one of several items included in one CHANGE ORDER form.

RFI No.: Show the number of the request for information. This may be known by another name such as COR (Change Order Request,) CPR (Change Proposal Request,) etc.

Project No., WBS No., Date, Project Name. Will auto-fill from information entered on the first tab.

Contractor: Name of General Contractor or Subcontractor, edit auto-fill as needed.

Direct Cost of Work:

Check here if explained on the Comment Sheet: If rates, unit costs or quantities may appear unreasonable compared to standard costs or quantities the reasons may be explained on the attached comment sheet and the box checked to indicate that there is an explanation.

A. Labor: Include the "wages paid" hourly direct labor and/or foreman necessary to perform the required change. "Wages paid" is the amount actually paid the employee, not the fully burdened charge rate used in the bid, etc. Supervisory personnel in district or home office shall not be included. Do not include the project superintendent, except as permitted by Section 7.2 of Supplementary Conditions. Supervisory personnel on the job-site, but with broad supervisory responsibility shall not be included as Direct Labor, except as permitted by Section 7.2 of Supplementary Conditions. Typically there will be only one superintendent on the job and his/her time shall not be included, except as permitted by Section 7.2 of Supplementary Conditions. Typically all other employees are eligible for inclusion. List by job title each person employed on the work, his/her hourly rate, the number hours work and the extended Total Cost. Do not list crews unless the rates for them are readily available in standard cost estimating references such as R. S. Means. Add the labor burden that was provided at the Pre-Construction conference and in compliance with the Contract Documents, and total the amounts in LABOR TOTAL.

B. Material: Include the acquisition cost of all materials directly required to perform the required change. List each material used in the work, the price per unit, name of the unit, the number of units used and the extended Total Cost. Add the tax rate and tax and total the amounts in MATERIAL TOTAL.

C. Equipment: Include the rental cost of equipment items necessary to perform the change. For company-owned equipment items, include documentation of internal rental rates submitted at the pre-construction conference. Charges for small tools, and craft specific tools are not allowed. List each piece of equipment used in the work, the rate by units of time (hour, day, week, etc.,) number of units of time the piece was in service on the work and the extended total cost. Add the tax rate, calculate the tax and total the amounts in EQUIPMENT TOTAL.

TOTAL DIRECT COST FOR THIS BREAKDOWN: Total of A. Labor, B. Material and C. Equipment. This is the amount that will be carried forward to the SUMMARY Sheet. This amount does **NOT** include Overhead and Profit. This will be added on the SUMMARY Sheet.

COMMENTS SHEET:

The COMMENTS SHEET uses the same heading as the SUMMARY and BREAKDOWN.

The COMMENTS SHEET includes three sections, one each for A. Labor, B. Materials and C. Equipment. These correspond to the sections in the BREAKDOWN. Each comment should be entered in the section to which it corresponds on the BREAKDOWN and numbered to correspond to the appropriate line. Comments are to be used only to explain unusual rates, costs or quantities.

UNIT PRICE BREAKDOWN:

The UNIT PRICE BREAKDOWN uses the same heading as the BREAKDOWN.

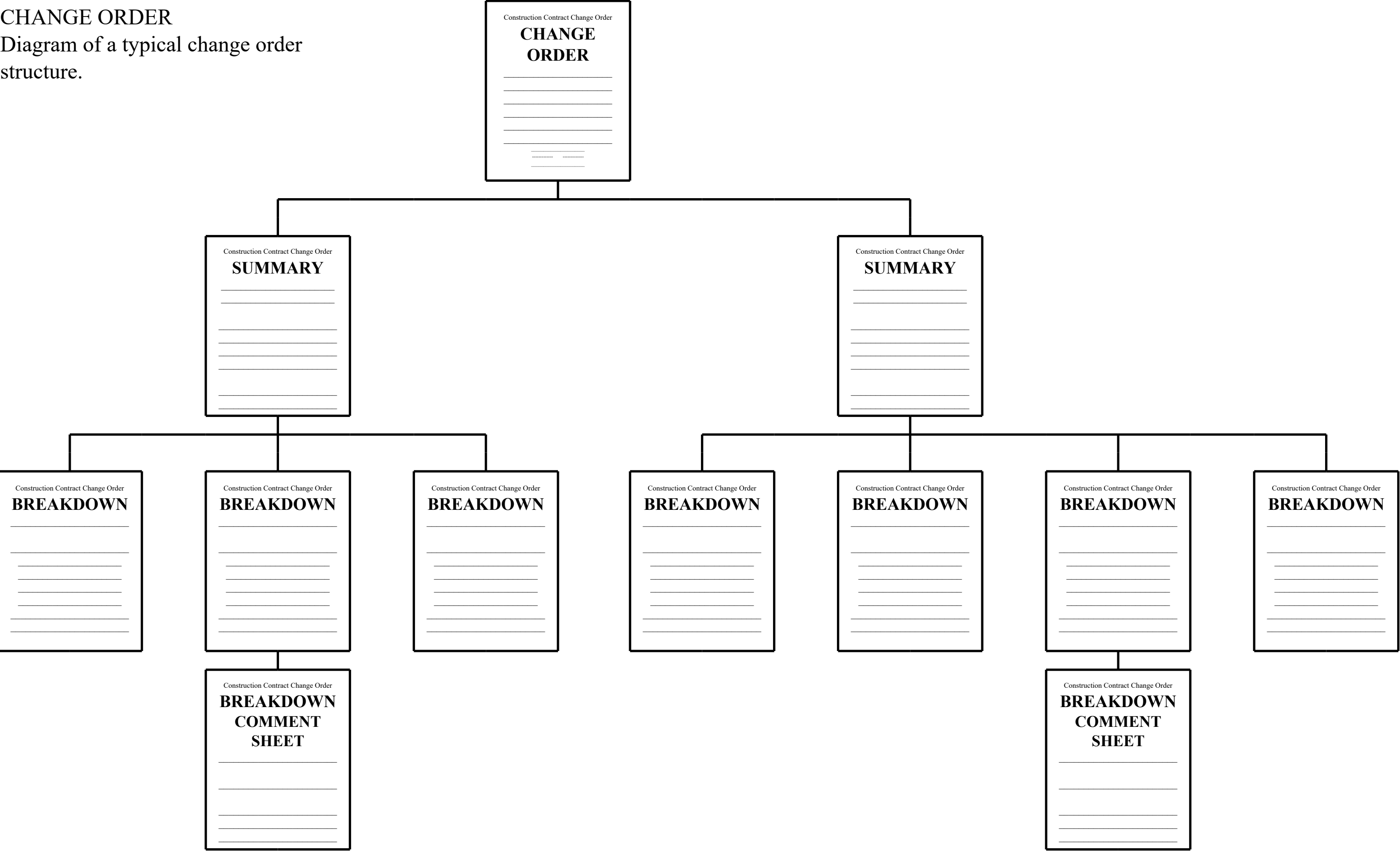
The UNIT PRICE BREAKDOWN is similar to the BREAKDOWN.

Unit Price Tabulation: Each unit price is listed along with its corresponding price and the number of units used in the work. The price and number of units are multiplied to provide the total cost of each unit price item. The pricing reference, such as the bid form for the project or a construction industry standard reference, must be cited for each unit price. This may be more fully described in "Reference Legend,"

Unit Price Total: Sum the unit prices to obtain the total cost for unit prices.

CHANGE ORDER

Diagram of a typical change order structure.



❖ NOT FOR RECORDATION PURPOSES ❖

Facility Planning & Control
PARTIAL OCCUPANCY

PROJECT NAME:

PROJECT LOCATION:

PROJECT / PART NUMBER:

CFMS / SRM No.

WBS NUMBER:

CONTRACTOR:

USER AGENCY:

The below described portion of subject project is, to the best of my knowledge and belief, complete to a point where the User desires to use in according with the Contract Documents.

DATE OCCUPIED: _____ .

WARRANTY items covered by Occupancy:

_____ Designer	_____ Date
_____ Contractor	_____ Date
_____ Facility Planning and Control	_____ Date

Punch List: Attached ☐

 None ☐

c: User Agency, ORM

❖ NOT FOR RECORDATION PURPOSES ❖

❖ NOT FOR RECORDATION PURPOSES ❖

Facility Planning & Control
RECOMMENDATION OF ACCEPTANCE

TO: FACILITY PLANNING AND CONTROL
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

Design Firm Name and Address

DATE: _____

PROJECT NAME: _____

PROJECT NUMBER: _____ WBS No. _____

SITE CODE: _____ STATE ID: _____ CFMS/SRM #: _____

CONTRACTOR: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

FINAL BUILDING AREA (SQ. FEET): _____

I certify that, to the best of my knowledge and belief, this project is substantially complete in accordance with the Plans and Specifications to the point where it can be used for the purpose which was intended. It is recommended that it be accepted.

DATE OF ACCEPTANCE: _____

CONTRACT DATE OF COMPLETION: _____

NUMBER OF DAYS (OVERRUN) (UNDERRUN) (As of Acceptance Date) _____

LIQUIDATED DAMAGES PER DAY STIPULATED IN CONTRACT \$ _____

VALUE OF PUNCH LIST \$ _____

Was part of project occupied prior to Acceptance? ☐ No ☐ Yes, see attached Partial Occupancy Forms

ADA Certificate of Compliance Required? ☐ No ☐ Yes, see attached form.

La. Building Code Certificate of Compliance Required? ☐ No ☐ Yes, see attached form.

ROOF GUAR-MANUF: _____ START DATE: _____ END DATE: _____

ROOFER: _____ START DATE: _____ END DATE: _____

Signed: _____
DESIGNER

FOR USE OF PROJECT MANAGER:

Signed: _____
PROJECT MANAGER

c: User Agency

❖ NOT FOR RECORDATION PURPOSES ❖

CERTIFICATE OF COMPLIANCE
with
Americans with Disabilities Act and Architectural Barriers Act
Accessibility Guidelines

TO: STATE OF LOUISIANA
DIVISION OF ADMINISTRATION
FACILITY PLANNING AND CONTROL
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

Design Firm Name and Address

PROJECT NAME: _____

PROJECT No.: _____

WBS No.: _____

SITE CODE: _____ STATE ID: _____

DATE OF ACCEPTANCE: _____

I, _____ certify that, to the best of my knowledge and belief, this project has been constructed in compliance with the Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines as reviewed by the fire marshal.

Designer Signature Date: _____

State of Louisiana
DIVISION OF ADMINISTRATION
Facility Planning and Control

CERTIFICATE OF COMPLIANCE
with
Louisiana Building Code for State Owned Buildings

TO: STATE OF LOUISIANA
DIVISION OF ADMINISTRATION
FACILITY PLANNING AND CONTROL
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

Design Firm or Owner/User Name and Address

PROJECT NAME: _____

PROJECT No.: _____

WBS No.: _____

SITE CODE: _____ STATE ID: _____

DATE OF ACCEPTANCE: _____

I, _____ certify that, to the best of my knowledge and belief,
this project has been constructed in compliance with the construction documents determined to be satisfactory
by the State of Louisiana, Division of Administration, Office of Facility Planning and Control.

(Signature of Designer or Owner/User) Date: _____

Name of Project

Project No.

STATE OF _____

PARISH OF _____

ATTESTATIONS AFFIDAVIT

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

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

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

- (a) Public bribery (R.S. 14:118)
- (b) Corrupt influencing (R.S. 14:120)

- (c) Extortion (R.S. 14:66)
- (d) Money laundering (R.S. 14:230)

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

- (a) Theft (R.S. 14:67)
- (b) Identity Theft (R.S. 14:67.16)
- (c) Theft of a business record
(R.S.14:67.20)
- (d) False accounting (R.S. 14:70)
- (e) Issuing worthless checks

- (R.S. 14:71)
- (f) Bank fraud (R.S. 14:71.1)
- (g) Forgery (R.S. 14:72)
- (h) Contractors; misapplication of
payments (R.S. 14:202)
- (i) Malfeasance in office (R.S. 14:134)

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

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

Name of Project

Project No.

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

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

NAME OF BIDDER

NAME OF AUTHORIZED SIGNATORY OF BIDDER

DATE

TITLE OF AUTHORIZED SIGNATORY OF BIDDER

**SIGNATURE OF AUTHORIZED
SIGNATORY OF BIDDER/AFFIANT**

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

Notary Public

34. Space Entitlements and General Procedures

Space Entitlements were designed to facilitate uniformity in planning for space for various state agencies.

It is the intent of Facility Planning to incorporate open planning with a minimal number of offices. The offices should be reserved for administrators or personnel that deal with confidential matters. Because of the frequent need for modifications, we feel that an open system would provide us with more flexibility.

The Space Entitlements are based on a three foot module for both offices and modular workstations. The sizes are as follows:

<u>ENTITLEMENT</u>	<u>DIMENSION</u>	<u>SQUARE FOOTAGE</u>
S036	6x6	36 Square Feet
S054	6x9	54 Square Feet
S081	9x9	81 Square Feet
S108	9x12	108 Square Feet
S144	12x12	144 Square Feet
S180	12x15	180 Square Feet
S216	12x18	216 Square Feet
S270	15x18	270 Square Feet

The designer shall incorporate the space entitlements when programming the offices and modular workstations. These are the only acceptable sizes. Square footages may be modified as much as 10% upward or 5% downward in the office areas only.

Support areas such as break-rooms, conferences, etc. shall be sized as necessary to accommodate the function.

GUIDELINES FOR SPACE ASSIGNMENTS

STANDARD	SIZE (Sq. Ft.)	ARRANGEMENT	DESCRIPTION
S036	6x6	Modular or Open Clerical, Data Entry, Student	Adequate size for Modular arrangement. In open plan, fits a desk and return.
S054	6x9	Modular or Open Clerical, Data Entry, Etc.	This is a good size for modular workstations. There is plenty of storage.
S081	9x9	Modular or Open Clerical, Professional	This is a good size for modular. It can fit a desk, shelf and one visitor.
S108	9x12	Office/Modular Typical Office for most Employees (Professional) that require a private office or Supervisor	Desk set up in conference type arrangement for two visitors. Can fit bookcases, files and worktables. Good standard size.
S144	12x12	Office Supervisor or Manager	Large office for someone who may have three or four visitors at a time, bookcases, files
S180	12x15	Office Administrator or Director	Large office. Used for Director or similar. Can fit a considerable amount of furniture and a small conference area.
S216	12x18	Office & Conference	Large office. Can have basic office set up with a conference or seating area.
S270	15x18	Office & Conference	Large office. Can be used for Secretary or Undersecretary. Can fit a considerable amount of furniture as well as a conference or seating area.
S315	15x21	Office & Conference	

Facility Planning & Control
LIQUIDATED DAMAGES ASSESSMENT

TO: FACILITY PLANNING & CONTROL
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

Design Firm Name and Address

DATE: _____

PROJECT NAME: _____

PROJECT NUMBER: _____ WBS No: _____

SITE CODE: _____ STATE ID: _____ CFMS: _____

CONTRACTOR: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

DATE OF ACCEPTANCE: _____

CONTRACT DATE OF COMPLETION: _____

NUMBER OF DAYS OVERRUN (As of Acceptance Date) _____

LIQUIDATED DAMAGES PER DAY STIPULATED IN CONTRACT \$ _____

LIQUIDATED DAMAGES ASSESSMENT \$ _____

Signed: _____
DESIGNER

Signed: _____
PROJECT MANAGER

c: User Agency

July 2022

LD-1

Facility Planning & Control
LIQUIDATED DAMAGES ASSESSMENT
(Procedure of How FPC Calculates Liquidate Damages at Acceptance)

- If Acceptance Date = Completion Date, then 0 days are assessed (mathematically If $AD = CD$, then $LD = 0$)
- If Acceptance Date is 1 day after Completion date, then 1 day is assessed (don't count acceptance date, mathematically If $AD - CD = 1$, then $LD = 1$)
- If Acceptance Date is 2 days after Completion date, then 1 day is assessed (don't count acceptance date or completion date, mathematically If $AD - CD > 1$, then $LD = AD - CD - 1$)
- If Acceptance date is 3 days after Completion date, then 2 days are assessed (same as line above)
- If Acceptance date is 4 days after Completion date, then 3 days are assessed... etc.

Section 01 00 00 General Requirements

Specifications

01 00 00-1

PART 1 - GENERAL

- 1.01 CONTRACTOR SUBMITTALS: Prior to the approval of the Contractor's Initial Pay Application, the following shall be submitted for approval by the Architect and review by the Owner:
- Progress Schedule.
 - Schedule of Values.
 - List of ALL Subcontractors, Principal Suppliers & Fabricators, and Specialty Contractors.
 - List of Contractor's staff assignments and principal consultants.
 - Copy of Building Permit.
- 1.02 PROGRESS SCHEDULE: Contractor shall submit his/her proposed Construction Progress Schedule to the Owner and the Architect at the Pre-Construction Meeting. The Schedule shall clearly identify the following:
- The Date of Acceptance of the project within the Contract Time.
 - Milestone dates as appropriate and applicable to the project.
- 1.03 SCHEDULE OF VALUES: Contractor shall prepare his/her Schedule of Values for each Work Line Item in accordance with the General Conditions.
- 1.04 CONTRACTOR'S INITIAL PAYMENT APPLICATION:
- Cover data submitted on AIA Document G702 (no substitutions) with all required information, signatures, and notarization.
 - Outline Work Line Items and Schedule of Values and Stored Materials in format similar to AIA Document G702 Continuation Sheets.
 - Must bear Architect approval signature prior to review/approval action by the Owner.
 - Owner will not approve for payment until all data listed in item #2 above has been submitted and approved.
 - Payment will be made in accordance with Owner's published schedule pending timely receipt & approval action.
- 1.05 CONTRACTOR'S PROGRESS PAYMENT APPLICATIONS:
- Shall comply with items 1.04a, 1.04b, 1.04c, and 1.04e above.
 - Contractor shall concurrently submit UPDATED Progress Schedules.
 - Shall include payment adjustments for FULLY EXECUTED Change Orders.
 - Affidavits of major subcontractors for no claims.
- 1.06 CONTRACTOR'S FINAL PAYMENT APPLICATION:
- Shall comply with items 1.04a, 1.04b, 1.04c, and 1.04e above.
 - Shall be clearly marked **"FINAL"**.
 - Payment will be made ONLY after completion of all Contract Close-Out items.
 - Payment after submission of clear lien and privilege certificate.
- 1.07 BARRICADES:
- Contractor shall not allow anyone nearby to be exposed to any harmful construction debris or hazardous materials (i.e., lead-based paint, asbestos, dust, noise, vapors, etc.). The Contractor shall install barricades as necessary for the protection and safety of pedestrian traffic and for protection of contiguous surfaces and items in the area of Construction. Barriers shall be erected and maintained for the duration of the Work in a room by room basis; air containment shall be required to minimize dust/odors. These containment barriers shall be subject to approval by Owner/Architect.
 - Barricades shall be maintained by the Contractor at all times during the course of construction; caution tape shall not be considered a safety barricade.
 - The Contractor shall keep the building secure and watertight (at any and all areas of the Contractor's work) at all times.

Section 01 00 00 General Requirements

Specifications

01 00 00-2

- 1.08 ACCESS, DAMAGE TO EXISTING STRUCTURES AND TRAFFIC RESTRICTIONS:
- a. The Contractor shall be permitted access to the site at the Owner's convenience. The Contractor shall be responsible for any repair and/or replacement of existing lawns, ditches, concrete walks, fencing or any other structures, including utilities damaged by the Contractor's operations.
 - b. The Contractor shall conduct a pre-construction site survey with a Owner's representative so that any such elements then needing repair or which is already damaged in any manner may be properly identified, described, and recorded. If no such damage is recorded, then any structures over which the Contractor has crossed during construction which are later found to be damaged shall be considered to have been so damaged by him and shall be repaired and/or replaced by the Contractor as necessary to return them to their original no cost to the Owner.
 - c. The Owner shall designate areas for parking. The construction operations of the Contractor may not cause any obstruction to the free flow of traffic on the adjacent streets without the prior consent of the proper authority.
 - d. Equipment (tools, etc.) that leak oil or other stains will not be allowed on existing paving. Contractor shall be responsible to repair surfaces to original condition.
- 1.09 TOILETS
- a. The Contractor shall provide and maintain temporary toilets as necessary for use of workmen unless otherwise noted. Locate toilets where directed, and keep toilets in sanitary condition.
- 1.10 DEMOLITION
- a. The Contractor shall perform all demolition necessary or required to complete the work shown on the drawings or described in the specifications. Take special precautions to protect existing work which is to remain in place or to replace or repair any damage to such work
- 1.11 TRASH AND DEBRIS
- a. The Contractor shall not permit construction waste, trash, debris to accumulate in the building or on the ground in the vicinity of the building and/or project area. The Contractor shall establish and maintain regular daily routine for removing construction waste, trash, debris and hauling it away from the premises.
 - b. The Contractor shall be responsible for the removal and offsite disposal of all construction waste, trash and debris from the Campus originating from the Project.
- 1.12 WARRANTY PERIOD
- a. All workmanship, materials, and equipment shall be guaranteed for a period of one year from the date of the official acceptance of the Contract, unless a longer period is stated in the specifications or in the manufacturer's literature.
 - b. When items of equipment or material fail to perform or to give satisfactory service during this warranty period, the Owner may require that corrections be made even to the extent of installing new equipment or materials. When this becomes necessary, the warranty period shall extend for a period of one year from the date of acceptance of the new installation. The extended warranty period shall apply only to those items which have not performed satisfactorily.
- 1.13 PUNCHLIST ITEMS
- a. At the time of the final inspection, a punch list with assigned monetary values will be compiled by the design professional in charge. If these items are not completed within the 45 day lien period, the monetary value of the items will be withheld and the item will be completed by the Owner.
- 1.14 TEMPORARY UTILITIES
- a. The Contractor shall provide utilities for the construction of the renovation of the Project.

Section 01 00 00 General Requirements

Specifications

01 00 00-3

1.15 RECORD DOCUMENTS:

- a. Contractor shall maintain one clean set of Contract Documents at the project site for the sole purpose of identifying by date and/or authority all As-Built conditions and authorized modifications as they occur during the progress of the Work.
- b. Contractor shall maintain an orderly file at the project site of all "APPROVED" and "APPROVED AS NOTED" submittals, shop drawings, etc.
- c. At each site visit, the Architect shall review the Contractor's As-Built Documents to see that they are correct and current; Architect shall advise the Owner accordingly.
- d. At completion of project, Contractor shall transmit on-site As-Built Documents to the Architect.

1.16 CONTRACTOR CLOSE-OUT DOCUMENTS:

- a. Owner requires three complete sets.
- b. Contractor shall logically organize similar to O&M manual criteria.
- c. ARCHITECT shall review (and sign where required) prior to transmitting to the Owner.
- d. Required documents include, but may not be limited to, originals and copies (put all originals in one three ring binder; put copies in the other two) of the following:
 1. General Contractor's Warranty.
 2. All Subcontractor & Specialty Contractor Warranties.
 3. All Manufacturer Warranties and Extended Warranties
 4. Executed Certificate of Substantial Completion.
 5. Executed Consent of Surety.
 6. Executed Waivers of Liens.

1.17 OSHA COMPLIANCE:

- a. The Contractor must send a copy of the site safety plan (Written documentation of a working and active employee safety program as defined by the OSHA Construction Standard), along with the site safety supervisors name and a 24-hour phone number to the Architect for submittal to the Owner.
- b. The Contractor shall make available the Material Safety Data Sheet (MSDS) for any hazardous material used or stored on-site. A copy of the MSDS will be sent to the Architect for submittal to the Owner for review prior to the project start date.
- c. Any injury requiring medical attention which occurs on site must be reported to Owner, and the Contractor shall conduct an investigation and develop action plan for prevention. This action plan may be reviewed by the Owner upon request at their option and/or OES may be an observer in investigations.
- d. Activities involving utility lines shall be closely coordinated with Utility Companies to avoid outages and accidents. Extreme caution must be taken to assure proper lockout/tagout of circuits to prevent injury and electrical flash/explosion.
- e. The Contractor shall be responsible for the proper disposal of waste materials. (Solid Waste, Hazardous Waste, etc.) Any regulated hazardous waste shipped off-site by the Contractor (or his subcontractors) shall be manifested to the Contractor (or his subcontractors).
- f. The Contractor shall be responsible for compliance with Water and Air Quality Standards as they relate to unauthorized releases or emissions of regulated substances into the environment (storm drains, bayous, etc.).

END OF SECTION

Section 01 10 00 Summary of Work

Specifications

01 10 00-1

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Contract Description.
- B. Phasing and/or Completion of parts of the Work
- C. Intent of the Contract Documents

1.02 DESCRIPTION OF WORK

- A. Work of the Project includes:
 - 1. Concrete foundation and slab on grade.
 - 2. Steel frame construction.
 - 3. SBS Modified Bitumen roofing systems.
 - 4. Standing Seam metal wall and roofing systems.
 - 5. CMU and brick masonry systems.
 - 6. Exterior plaster wall system.
 - 7. Metal stud and gypsum board framing, finishing, and painting.
 - 8. Aluminum storefront framing.
 - 9. Wood and FRP doors.
 - 10. Glazing at door and openings.
 - 11. Joint Sealants.
 - 12. Suspended specialty, acoustical, and gypsum board ceilings.
 - 13. Mechanical, electrical, and plumbing systems.
 - 14. Site work, utilities, and fencing.
 - 15. Cutting and patching as required to perform all work indicated in the drawings and specs; patching where items are removed (to match existing).
- B. Contractor shall provide work indicated in drawings, specifications, and Contract.
- C. Items to be re-used shall be thoroughly cleaned (and any existing paint removed) so as to give an 'as new' appearance to the item.
- D. The Contractor shall provide all equipment necessary to perform the Work.

1.03 THE CONTRACT AND USE OF SITE

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

Section 01 10 00 Summary of Work

Specifications

01 10 00-2

2. A Certificate of Substantial Completion will be executed in accordance with conditions of the Contract.
 3. General Contractor shall obtain a Certificate of Occupancy from the State Fire Marshal and Facility Planning & Control (FP&C) prior to Owner occupancy.
 4. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.
 5. Prior to partial Owner occupancy, emergency and life safety systems shall be fully operational. Emergency and life safety systems include, but are not limited to, fire sprinkler systems, fire alarm systems, and emergency egress devices. For emergency exiting purposes, the path of travel shall be clearly delineated and functional. If required, temporary barricades shall separate on-going construction from occupied spaces as allowed by the governing agency holding jurisdiction over the Project. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of emergency and life safety systems in occupied portions of the building.
 6. Training: Refer to Section 01 70 00 – Contract Closeout.
- C. Owner-Furnished Items:
1. The Owner may provide items to the General Contractor for installation in accordance with manufacturer's recommendations and instructions.
 2. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Construction Schedule, and will inspect deliveries for damage.
 3. If Owner-furnished items are damaged, defective or missing, through no fault of the General Contractor, the Owner will arrange for replacement.
 4. The General Contractor is responsible for designating the delivery dates of Owner-furnished items in the Construction Schedule and for receiving, unloading and handling Owner-furnished items at the site. The General Contractor/Design-Builder is responsible for protecting Owner-furnished items from damage, including damage from exposure to elements, and to repair or replace items damaged as a result of his operations.
- D. Coordination with Owner's Forces or Owner's Contractors:
1. Provide site access, space allocation, scheduling, scheduling coordination, coordination of work forces and coordination of technical requirements with Contractors that may be selected and employed by Owner to perform work simultaneously and in conjunction with the Work, which may include, but shall not be limited to the following, as applicable to the Project:
 - a. Furniture Installer
- 1.04 STAGING AND PHASING OF WORK
- A. The Contractor shall be aware that the current baseball field and facility are currently occupied by the Owner and will be utilized continually during the construction period.
 - B. The Contractor shall coordinate staging of work with the Owner, taking into account the Owner's facility schedule that will be provided at the Pre-Construction Conference.
 - C. The Contractor shall coordinate with the Building Coordinator to move personal items away from construction area. Contractor is to photograph existing conditions prior to moving any equipment/ furniture.
 - D. Contractor shall coordinate any corrective efforts with the Owner's use of the facility and only after obtaining express written consent of the User.

Section 01 10 00

Summary of Work

Specifications

01 10 00-3

- 1.05 CORRELATION AND INTENT OF CONTRACT DOCUMENTS
 - A. In the event of conflicting information the Contractor shall bid the more costly (of monetary value) of the conflicting information. These requirements set forth herein shall not apply if the items in question have been addressed, clarified, and/or corrected by Addendum.

END OF SECTION

Section 01 20 00

Price and Payment Procedures

ALTERNATES

PART ONE-GENERAL

1.01 DESCRIPTION:

- A. An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
- B. The cost for each alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
- C. Related Work Described Elsewhere:
 - 1. Materials and methods to be used in the Base Bid and in the Alternates have been described on the Drawings and in pertinent Sections of these Specifications.
 - 2. Method for stating the proposed Contract Sum is described in the bid form.

1.02 All alternates described in this Section are required to be reflected on the Bid Form as submitted by Bidders. Do not submit Alternates other than as described in this Section.

1.03 If Owner elects to proceed on the basis of one or more of the Alternates, make all modifications to the work required in furnishing and installing the selected Alternates to the approval of the Architect and at no additional cost to the Owner other than as proposed on the Bid Form.

1.04 All Alternates must be executed with an appropriate response. A "blank space" or a "No Bid" statement is inappropriate. The space must include a "Specific Sum" or a "No Change in Price" statement. Failure to provide this information may be cause for rejection of the bid.

1.05 ALTERNATE SCHEDULE:

- A. Alternate No. 1:

END OF SECTION

Section 01 25 00

Substitutions

Specifications

01 25 00-1

PART ONE - GENERAL

1.01 REQUIREMENTS

- A. Substitutions for products specified shall be allowed only under the conditions stated in this section.

1.02 SUBSTITUTIONS/PRIOR APPROVALS

- A. If it is desired to use products different from those indicated in the Contract Documents, the party requesting the substitution shall make written application as described herein. The burden of proving equality of proposed substitutions rests on the party making the request for substitution. Requests for substitution shall reach the Architect not less than four (4) working days prior to the date for opening of bids. Requests received by the Architect after this date will not be considered.

1.03 SUBMITTALS

- A. Submit a separate request for each substitution. Support each request with:
 - 1. Date of request.
 - 2. Name of party proposing substitution.
 - 3. Project name.
 - 4. Specification reference.
 - 5. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature, identify:
 - (1) Product description.
 - (2) Reference standards.
 - (3) Performance and test data.
 - (4) Manufacturer's recommendations for use and installation.
 - c. Samples, as applicable.
 - d. Name and address of similar projects on which product has been used, and date of each installation.
 - 6. Itemized comparison of the proposed substitution with product specified, list all variations.
 - 7. Data relating to changes in construction schedule.
 - 8. Any effect of substitution on separate contracts.
 - 9. List of changes required in other work or products.
 - 10. Designation of required license fees or royalties.
 - 11. Designation of availability of maintenance services, sources of replacement materials.
- B. If a proposed substitution is approved by the Architect, an addendum will be issued to prospective bidders not less than three (3) days prior to the date set for opening bids. If a substitution does not appear in an addendum it shall mean that the Architect has not approved the product and the successful bidder shall be responsible for furnishing materials and products in accordance with the Contract Documents. Following the receipt of bids, no further requests for substitution of products or materials will be considered.

- 1.04 CONTRACTOR'S REPRESENTATION: In connection with the use of any substitute item approved by the Architect it shall be the General Contractor's responsibility to see that such items meet all space requirements, and that any alterations to connecting items necessitated by use of the alternate items are properly made at no increase in cost to the Owner, and that all items are in compliance with the specification requirements. Contractor waives all claims for additional costs caused by substitutions which may subsequently become apparent.

END OF SECTION

Section 01 30 00

Administrative Requirements

Specifications

01 30 00-1

COORDINATION

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Coordination.
 - B. Field engineering.
 - C. Pre-installation meetings.
- 1.02 COORDINATION
 - A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of construction elements , with provisions for accommodating Owner's items.
 - B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
 - C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
 - D. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
 - E. Coordinate completion and clean up of Work of separate sections in preparation for Date of Acceptance.
 - F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- 1.03 FIELD ENGINEERING
 - A. The Contractor may offer alternative materials and methods proposals for a cost savings for the Owner. If these proposals entail extensive evaluations by the Architect and/or his consultants, these proposals shall include costs for evaluation fees commensurate with the amount of evaluation and liability involved, and shall due the Architect as Additional Services.
- 1.04 PREINSTALLATION MEETING
 - A. When required in individual specification sections, convene a pre-installation meeting at work site prior to commencing work of the section.
 - B. Require attendance of parties directly affecting, or affected by, work of the specific section.
 - C. Notify Architect/Engineer seven days in advance of meeting date.
 - D. Prepare agenda and preside at meeting:
 - 1. Review conditions of installation, preparation and installation.
 - 2. Review coordination with related work.
 - E. Required pre-installation meetings (but are not limited to):
 - 1. Cast-in-Place Concrete
 - 2. Roofing
 - 3. Brick Masonry
 - 4. Athletic Equipment
 - 5. Turf and Athletic Flooring

PART 2 - PRODUCTS

No information necessary.

PART 3 - EXECUTION

No information necessary.

Section 01 30 00
Administrative Requirements

Specifications

01 30 00-2

END OF SECTION

Section 01 31 00 Coordination Drawings

Specifications

01 31 00-1

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Coordination Drawings
 - B. Coordination with Requirements of related sections of the specifications.
- 1.02 RELATED SECTIONS
 - A. Refer to Mechanical and Electrical Sections
- 1.03 COORDINATION DRAWINGS
 - A. The Contractor shall coordinate work of all various sections having interdependent responsibilities for installing, connecting to, and placing such equipment. At the Contractor's expense, all (including, but not limited to, mechanical, plumbing, electrical system) necessary offsets, bends, duct size/configurations, crossings/cross-overs shall be provided and installed as necessary to integrate within the structural system and the architectural features (ceilings and walls, etc.)
 - B. Coordination Drawings: The purpose of the coordination drawings is to assure proper forethought and coordination of integrating all systems of the building within the structural framework, architectural ceilings, floors, and walls of the building. The Contractor shall provide coordination drawings prior to the submittal of all system shop drawings. The coordination drawings shall include ductwork and all mechanical HVAC piping and associated items, plumbing verticals and sprinkler piping, chases, electrical conduit, and shall indicate sizes of these items and the structural members.
 - C. The Contractor shall submit the Coordination Drawings to the Architect for the Architect's approval no later than one month after the Work has commenced on the project site. The Contractor shall revise and re-submit the Drawings as the Architect may require.
 - D. The Coordination Drawings shall include, but is not limited to, the following:
 - 1. Plan drawings for each floor indicating structural member sizes, HVAC components sizes/routes/locations, major electrical conduit grouping/routes, vertical chases/openings, and all other items as necessary to comply with the requirements of 1.03.A and 1.03.B of this Section.
 - 2. Section Drawings through major pathways for systems (such as corridors, if appropriate), and exemplary rooms.
 - 3. Prior to commencement of preparing the Drawings, the Contractor shall confirm the proposed listing of drawings to be submitted.
 - 4. Any and all other drawings, schedules, and information necessary to illustrate the Contractor's understanding of the architectural design intent of the critical ceiling heights, wall locations, and all other design parameters and how they are accommodated upon the Contractor's proposed integration of the Systems noted in the Contract Documents.
 - E. During the course of construction, the Contractor shall update the Coordination Drawings in a clean, clear, and legible manner and have the Drawings readily available on-site for the Architect's access. Upon Substantial Completion, the Contractor shall submit the updated Coordination Drawings to the Architect for the Owner's future use and shall be the property of the Owner.

END OF SECTION

Section 01 31 19 Project Meetings

Specifications

01 31 19-1

PART 1 - GENERAL

1.01 SUMMARY

- A. Project meetings:
 - 1. Regular meetings throughout Project life for discussion and resolution of Project issues. These meetings will be held on a frequency related to Project status, ie., weekly, bi-weekly, monthly, or others.
 - 2. Attendance by the Contractor, Owner, and Architect is mandatory. Architect's engineers or consultants, Contractor's subcontractors, suppliers, and others are to attend on an as-needed basis or as directed by Architect.
 - 3. Suggested agenda:
 - a. Progress review.
 - b. Schedule
 - c. Submittal's status.
 - d. Change Order status.
 - e. RFI status
 - f. Other business
- B. Requirements below are intended for Contractor, subcontractors, sub-subcontractors, and material suppliers for discussion and resolution of Project specific situations. Attendance by Owner, Architect, Architect's engineers or consultants is not mandatory.
 - 1. Meetings between Contractor, Owner, Architect, or any combination of the three for purpose of discussing Project progress or resolving problems are delineated above.
 - 2. Owner and Architect may attend meetings to ascertain work is expedited consistent with Contract Documents and construction schedules.
- C. Contractor requirements include:
 - 1. Schedule and administer preconstruction meeting, periodic progress meetings, and specially called meetings throughout work progress.
 - 2. Prepare agenda for meetings.
 - 3. Distribute written notice of each meeting four days in advance of meeting date.
 - 4. Make physical arrangements for meetings.
 - 5. Preside at meetings.
 - 6. Record minutes; include significant proceedings and decisions.
 - 7. Reproduce and distribute copies of minutes within three days after each meeting as follows:
 - a. One copy to each participant in meeting.
 - b. One copy to parties affected by decisions made at meeting.
 - c. Three copies of minutes to Architect.
 - d. One copy to Owner's representative.
- D. Representatives of contractors, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- E. Related sections:
 - 1. Section 01 03 90: Coordination and Meetings
 - 2. Section 01 33 00: Submittals
- F. Pre-construction meeting:
 - 1. Schedule within 10 days after date of Notice of Award.
 - 2. Location: Central site, convenient for all parties, designated by the Owner.
 - 3. Attendance:
 - a. Owner's Representative
 - b. Architect and professional consultants.
 - c. Resident Project Representative
 - d. Contractor's Superintendent
 - e. Major subcontractors.
 - f. Major suppliers.
- 4. Suggested agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.
 - b. Projected Construction Schedules
 - 2. Critical work sequencing.
 - 3. Major equipment deliveries and priorities.
 - 4. Project coordination: Designation of responsible personnel.

Section 01 31 19

Project Meetings

Specifications

01 31 19-2

5. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change Orders
 - e. Applications for Payments
 6. Adequacy of distribution of Contract Documents.
 7. Procedures for maintaining Record Documents.
 8. Use of premises:
 - a. Office, work and storage areas.
 - b. Owners requirements.
 9. Temporary facilities, controls, and construction aids.
 10. Temporary utilities.
 11. Safety and first-aid procedures.
 12. Security procedures.
 13. Housekeeping procedures.
- G. Progress meetings:
1. Schedule regular periodic meetings as required, but not less than two meetings monthly.
 2. Hold called meetings as required by progress of work.
 3. Meeting's locations: Project field office of Contractor.
 4. Attendance:
 - a. Subcontractors, as appropriate to agenda.
 - b. Suppliers, as appropriate.
 - c. Architect and professional consultants, as needed or required.
 5. Suggested agenda:
 - a. Review, approval of minutes of previous meeting.
 - b. Review of work in progress since previous meeting.
 - c. Field observations, problems, conflicts.
 - d. Problems which impede Progress Schedule
 - e. Review of off-site fabrication, delivery schedules.
 - f. Corrective measures, procedures to regain projected schedule.
 - g. Revisions to Progress Schedule.
 - h. Progress; schedule, during succeeding work period.
 - i. Coordination of schedules.
 - j. Review submittal schedules; expedite as required.
 - k. Maintenance of quality standards.
 - l. Pending changes and substitutions.
 - m. Review proposed changes for effect on:
 - 1) Progress schedule and on completion date.
 - 2) Other contracts of Project.
 - n. Review Monthly Pay Applications

END OF SECTION

Section 01 32 00 Project Scheduling

Specifications

01 32 00-1

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Schedules
- B. Coordination with Requirements of related sections of the specifications.

1.02 RELATED SECTIONS

- A. Refer to Mechanical and Electrical Sections

1.03 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of construction elements , with provisions for accommodating Owner's items.
- B. Coordinate work of various sections having interdependent responsibilities for scheduling, installing, connecting to, and placing such equipment.
- C. The Contractor shall coordinate his work in conjunction with that of the Owner's other contractors upon the onset of nearing Substantial Completion.
- D. Key the Submittals Schedule with the Project Construction Schedule such that the Submittals receive approval from the Designer prior to the ordering and subsequent delivery of the materials.
- E. The Contractor shall coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.
- F. Construction Schedule: The Contractor shall provide the baseline, electronic version (in the original software format) to the Architect for his review and file. The Schedule shall include all start, stop, and completion dates for all building components and systems, as deemed appropriate by the Architect. The Contractor shall submit a schedule with a credentialed scheduling professional's review and approval. The Contractor's Submittal Schedule shall be coordinated with the Construction Schedule.

1.04 CPM SCHEDULE PREPARATION

- A. All scheduling requirements listed herein shall be provided in both printed and electronic format. Review and approval of the CPM Schedule(s) by the Design Team does not relinquish the responsibility of the Contractor to complete the project within the Contract Performance Period, as amended in accordance with the Agreement.
- B. Upon execution of the Agreement, the Contractor shall prepare a bar chart schedule which shall depict the general approach to the construction process. This bar chart schedule shall include all major events and key milestones broken out by CSI Divisions. This bar chart schedule shall be distributed for use and discussion at the Pre-Construction Meeting.
- C. Upon execution of the Agreement, the Contractor shall prepare an initial submittal schedule which shall depict all submittals required for the project as indicated in the Project Manual. The submittal schedule shall be prepared in a manner that indicates the submittal review period of 10 days, a 10 day re-review, procurement duration, and delivery. This initial submittal schedule shall be distributed for use and discussion at the Pre-Construction Meeting.
- D. Within 10 days after the Pre-Construction Meeting, the Contractor shall prepare a detailed CPM Schedule, in Bar Chart Format, for the first 120 days of the project for review and approval by the Design Team. Approval of this submittal is a pre-requisite to the first Application for Payment. This 120 day CPM Schedule shall include all administrative and work activities that will occur during this period. Activities shall be clearly identifiable with the required performance of scope. All activities shall have a maximum duration of 15 calendar days. The CPM Schedule shall include the following for each Activity – ID, Description, Early Start date, Early Finish date, Duration, Total Float. The CPM Schedule shall incorporate the submittal schedule previously provided, with modifications as necessary to coordinate with the detailed schedule data.
- E. Within 45 days after the Pre-Construction Meeting, the Contractor shall prepare a detailed CPM Schedule, in Bar Chart Format, for the entire Contract Performance Period for review and approval by the Design Team. Approval of this submittal is a pre-requisite to the second Application for Payment, and shall become the Baseline or Target Schedule for the project. The Target schedule performance period shall be representative of that indicated within the Agreement, and shall include all administrative and work activities that will occur during the project. Activities shall be clearly identifiable with the required performance of scope. All activities shall have a maximum duration of 15 calendar days. The CPM Schedule shall

Section 01 32 00 Project Scheduling

Specifications

01 32 00-2

include the following for each Activity – ID, Description, Early Start date, Early Finish date, Duration, Total Float. The CPM Schedule shall incorporate the submittal schedule previously provided, with modifications as necessary to coordinate with the detailed schedule data.

- F. Included in Schedule shall be milestones for all utility tie-in verification (both site and existing building as applicable), and coordination drawings submittals – including all critical verification included in the coordination drawing submittal.

1.05 CPM SCHEDULE UPDATES

- A. Project Schedule updates shall be prepared for distribution, review and approval and at a frequency as required by the Design Team. A Project Schedule update shall be prepared to accurately reflect the progress of work and shall be submitted with the Application for Payment, at a minimum. Failure to provide an accurate CPM update may delay the processing of payment. Updated Project Schedules shall represent the performance period stipulated or as modified in accordance with the Agreement. In the event that extended performance periods are evident in the Project Schedule update(s), the Contractor shall prepare a recovery schedule within 7 days and submit to the Design Team for review and approval. Failure to provide an accurate CPM recovery schedule may delay the processing of payment.

1.06 CPM SCHEDULE AND REQUESTS FOR CHANGE by the Contractor

- A. For any Request for Change (RFC) or Change Order Request (COR) where an adjustment to the Contract Performance Period is included, the Contractor shall include an adjusted CPM schedule substantiating the request for the time extension. An extension to the Contract Performance Period shall be considered only when the project schedules critical path is impacted, as validated by the Design Team.

1.07 CPM SCHEDULE AND REQUESTS FOR CHANGE by the Design Team

- A. In the event that the Design Team initiates a proposed change in scope (PCS) that may impact the project, the Contractor shall prepare an adjusted CPM schedule to substantiate the impact, and submit same to the Design Team within 7 days of the receipt of the PCS. Contingent upon the impact, the PCO may be withdrawn.

END OF SECTION

Section 01 33 00

Submittals

Specifications

01 33 00-1

PART ONE - GENERAL

1.01 DESCRIPTION

- A. Submittals: General term including samples, shop drawings and product data, as applicable and as defined by the General Conditions.
- B. General Provisions:
 - 1. Provisions in this section are mandatory procedures for review, approval and submitting samples, shop drawings and product data in accordance with the General Conditions.
 - 2. Submittals which are received directly from sources other than through the Contractor's office will be returned to the Contractor "without action".
 - 3. Job delays occasioned by requirement of re-submission of samples, shop drawings and product data not in accord with Contract Documents and/or submittals sequenced contrary to the agreed schedule are Contractor's responsibility, and will not be considered valid justification for extension of contract time or increase in the contract sum.

1.02 SAMPLE PREPARATION

- A. Prepare samples in sizes, shape and finish in accord with provisions of individual specification sections.
- B. Samples are not to be confused with full size, on-the-site "Mock-Ups" called for in some specification sections.
- C. Samples shall be submitted for the Architect's selection and approval in accordance with the Contractor's submittal schedule or sooner as needed to maintain construction progress. Approvals and color selections will not be made unilaterally where samples or selections of adjacent materials must be made for the purpose of aesthetics. Submit samples for adjacent and interrelated materials concurrently. The Owner will approve colors before the Architect can take action.
- D. The number of samples submitted shall be the number required by the Contractor, plus two (2) which will be retained by the Architect and the Owner, unless otherwise indicated.

1.03 SHOP DRAWING PREPARATION

- A. Drawing shall conform to the following requirements:
 - 1. Number sheets consecutively.
 - 2. Indicate working and erection dimensions, relationships to adjacent work.
 - 3. Show arrangements and sectional views, where applicable.
 - 4. Indicate material, gauges, thicknesses, finishes and characteristics.
 - 5. Indicate anchoring and fastening details, including information for making connections to adjacent work.
 - 6. Indicate working and erection dimensions and relationships to adjacent work. Concurrent submittals of different aspects of work may be required by the Architect as deemed necessary to demonstrate Contractor's ability to understand these relationships and coordinate the Work.
 - 7. Provide 6" x 6" clean space in the lower right hand area for entry of approval stamps.
 - 8. Cross-reference drawing details and specification paragraphs applicable to the submittal data.
- B. Form: Submit original shop drawings in the number required by the Contractor, plus two (2) which will be retained by the Architect and the Owner, unless otherwise indicated. Markings shall be in color on each copy, in a form suitable for opaque reproduction.

1.04 PRODUCT DATA PREPARATION

- A. Include product manufacturer's standard printed material, dated, with product description and installation instructions indicated. Data not related to this project shall be deleted, marked-through or marked "VOID" as applicable.
- B. Form: Number of copies submitted shall be the number required by Contractor plus two (2) which will be retained by Architect and Owner.
- C. Printed material shall be:

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Submittals

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01 33 00-2

1. Legible.
 2. Sized no larger than 8-1/2" x 11", suitable for opaque reproduction.
 3. Stamped (either on a clean-area space or the reverse side) with the Contractor's approval action.
- D. All submitted data shall bear the Contractor's approval action stamp plus his review notes, comments, and corrections as required.
- 1.05 CONTRACTOR'S REVIEW
- A. Review submittals and stamp with approval prior to submission to the Architect; Contractor's stamp shall bear the Contractor's name, the word "Approved", the signed initials of the approving agent, and the date of his approval action. By so noting, the Contractor indicates that he has reviewed and approves the materials, equipment, quantities and dimensions represented by the particular submittal.
 - B. Where work is indicated "By others", Contractor shall indicate responsibility for providing and coordinating such work.
 - C. Submissions made without Contractor's approval indicated thereon will be returned without being reviewed for compliance with this requirement.
 - D. Date each submittal and indicate name of Project, Architect, Contractor, Sub-Contractor, as applicable, description or name of equipment, material or product and identify location at which it is to be used in the Work. Cross-reference to specific drawing and specification references.
 - E. Accompany submittal with transmittal letter containing project name, Contractor's name, number of samples or drawings, titles and other pertinent data. Transmittal shall outline deviations, if any, in submittals from requirements of Contract Documents.
- 1.06 ARCHITECT'S REVIEW AND APPROVAL
- A. Architect's Review will be in accordance with the General Conditions.
 - B. Architect will return only the following submittal data to the Contractor for his further reproduction and distribution.
 1. All but two (2) copies of the submitted Shop Drawings.
 2. All but two (2) copies of the submitted Product Data.
- 1.07 RESUBMISSION
- A. Make corrections and changes indicated for unapproved submissions and resubmit in same manner as specified above, until Architect's approval is obtained.
 - B. In resubmission transmittal direct specific attention to revisions other than corrections requested by Architect on previous submissions, if any.
 - C. Contractor shall be responsible for bearing all costs associated with the review and approval process of resubmitted (and/or substituted) submittal data.
- 1.08 DISTRIBUTION
- A. Contractor is responsible for obtaining and distributing copies of submittals to his subcontractors and material suppliers after, as well as before, final approval. Prints of reviewed shop drawings shall be made from transparencies which carry the Architect's appropriate stamp.
 - B. Contractor shall maintain a file of approved submittals for duration of project, which shall be delivered to Owner as a part of project close-out documents.
 - C. The Contractor shall maintain a file of all approved submittals, bearing the Stamp of the Architect, at the project site. In the event the Architect or Owner should question the installation of any aspect of the work requiring approved submittal data, the inability of the Superintendent to produce the required approved submittal data upon demand shall constitute cause for a "stop work" order to be issued on that particular questioned aspect of the work and all relevant appurtenant work. The cause shall be equal to the Contractor's not having received required approval of the submittal data. If so issued, such "stop orders" shall not be considered valid justification for extensions of contract time and/or claims for additional monetary compensation.
- 1.09 SCHEDULE OF SUBMITTALS
- A. The Contractor shall, within ten (10) calendar days following award of the Contract, submit

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Submittals

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01 33 00-3

- his proposed schedule of submittals to the Architect for review.
- B. The purpose of the schedule is to:
 - 1. Demonstrate that all submittals, shop drawings, data, samples and mock-ups required for the Work are addressed by the Contractor.
 - 2. Demonstrate consistency with the Contractor's proposed Construction Schedule.
 - 3. Assist the Architect in scheduling timely review/approval action of submittals.
 - C. The schedule shall contain the description of the submitted item, the proposed date of submittal and the proposed date of requested return by the Architect.
 - D. After the Architect's receipt of the Contractor's submittal schedule, the Architect and the Contractor shall jointly review the schedule and mutually agree to acceptability or necessary modifications.
 - E. Contractor shall submit his final accepted schedule within five (5) calendar days after the date of the joint review.

END OF SECTION

Section 01 40 00 Quality Requirements

Specifications

01 40 00-1

QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances
- C. References.
- D. Inspecting and testing laboratory services.
- E. Manufacturers' field services and reports.

1.02 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures: Submission of manufacturers' instructions and certificates.
- B. Section 01 60 00 – Product Requirements: Requirements for material and product quality.

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

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

1.04 TOLERANCES

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

1.05 REFERENCES

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date specified in the individual specification sections, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Architect/Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 INSPECTING AND TESTING LABORATORY SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent firm to perform inspecting and testing.
- B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Architect.
- C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Architect or the Owner.
- D. Reports will be submitted by the independent firm to the Architect and Program Manager, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

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- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Architect and independent firm 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
 - F. Testing does not relieve Contractor to perform Work to contract requirements.
 - G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect. Payment for retesting will be charged to the Contractor by deducting inspecting or testing charges from the Contract Sum/Price.
- 1.07 MANUFACTURERS' FIELD SERVICES AND REPORTS
- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as applicable, and to initiate instructions when necessary.
 - B. Submit qualifications of observer to Architect 30 days in advance of required observations; the observer is subject to the approval of the Architect.
 - C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
 - D. Submit report in duplicate within 30 days of observation to Architect/Engineer for information.

PART 2 - PRODUCTS

No information necessary.

PART 3 - EXECUTION

No information necessary.

END OF SECTION

Section 01 60 00

Product Requirements

Specifications

01 60 00-1

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.

1.02 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.03 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.04 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.05 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.06 PRODUCT SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions during bidding period to requirements specified in this section.
- B. A request constitutes a representation that Bidder:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

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Product Requirements

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- C. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

Section 01 65 00
Project Record Documents
Specifications

01 65 00-1

PART ONE - GENERAL

- 1.01 REQUIREMENTS INCLUDED:
- A. Maintain at Project Site for Owner, one (1) record copy of:
 - 1. Drawings.
 - 2. Project Manual/Specifications.
 - 3. Addenda.
 - 4. Change Orders and other Modifications to Contract.
 - 5. Field Orders or written instructions.
 - 6. Approved and Approved As Noted Shop Drawings, Product Data and Samples.
 - B. Make Record Documents available to Architect.
 - C. Submit final Record Documents with Closeout Documents.
- 1.02 QUALITY ASSURANCE:
- A. Make entries within twenty-four (24) hours after receipt of information except note dimensional corrections and new dimensional data immediately upon determination.
 - B. Do not permit record sets to be used for any other purpose.
- 1.03 RECORD DOCUMENTS:
- A. Field Record Drawings: One complete set of Drawings upon which all changes to Work are recorded daily with colored pencil to provide accurate, factual information relative to Work as constructed, both visible and concealed. Entries shall be made on line prints provided by Architect with each sheet bearing rubber stamp impression reading "Record Drawings".
 - 1. Identify entry by "cloud" type circle around affected Work. Initial and date each entry.
 - 2. Record the following:
 - a. Horizontal location and elevation of underground portions of Work.
 - b. Location, size and arrangement of exposed mechanical and electrical portions of Work.
 - c. Changes and corrections to dimensions.
 - d. Changes to materials, products, equipment and finishes.
 - e. Changes and deviations in Work from that indicated in Contract Documents.
 - f. Identify equipment, valves, piping, conduit, fixtures and devices using symbols and designations corresponding to those used in Contract Documents.
 - B. Final Record Drawings: One complete set of opaque reproducible documents upon which all changes to Work are transferred from Field Record Drawings in red ink or red pencil.
 - C. Field Record Specifications: One complete set of Project Manual/Specifications within which changes to materials, products, equipment, and systems are recorded; also, note which specified manufacturer was used. Make corrections with colored pencil and mark the Manual "Record Specifications" on outside back binding.
 - D. Final Record Specifications: Either Field Record Specifications volume or new set of Specifications bearing all changes transferred from Field Record Specifications.

END OF SECTION

PART ONE - GENERAL

1.01 DEFINITIONS:

Closeout is hereby defined to include the general requirements near the end of the Contract Time, in preparation for substantial completion, final acceptance, final payment, normal termination of the Contract, occupancy by the Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in the sections of Division 1 through 16. The time of closeout is recognized to be directly related to "Substantial Completion", and therefore may be either a single time period for the entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates.

After the Contractor receives an executed copy of "Recommendation of Acceptance" of the project, he shall prepare, assemble and transmit the documents, brochures and drawings herein required in one package.

1.02 SUBSTANTIAL COMPLETION: Prior to requesting Architect's inspection for Substantial Completion (for either the entire work or portions thereof), complete the following and list all known exceptions in the request:

- A. Submit last progress-payment request, with sworn statement showing 100 percent completion of the work (less value of items to be completed or corrected), complete with associated releases, consents.
- B. Advise Owner of pending insurance changeover requirements.
- C. Touch-up and otherwise repair and restore marred exposed finishes.
- D. A comprehensive list of the items to be completed or corrected.

1.03 NOTICE OF ACCEPTANCE: Prior to requesting Architect's final inspection for final payment, as required by the General Conditions, complete the following and list known exceptions (if any) in request:

- A. Submit final payment request with final releases and supports not previously submitted and accepted.
- B. Submit record drawings (on vellum) and specs, and final record information.
- C. Submit record documents, special guarantees, warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- D. Submit copy of Architect's punch-list of itemized work to be completed or corrected, stating each item has been completed or otherwise resolved
- E. Complete the final cleaning.
- F. Submit a lien and privilege certificate from the Clerk of Court, 19th Judicial District Court, Parish of East Baton Rouge, dated at least forty-six (46) days after the date of the recording of the Owner's acceptance of the Project.

1.04 SUBMITTALS:

- A. General: Specific requirements for submittal documents are indicated in individual Sections of these Specifications.
- B. Warranties:
 - 1. The words "Warranty" and "Guarantee" as used anywhere in the text of the Contract Documents shall be interchangeable and synonymous meaning "a legally binding guarantee".
 - 2. Specific warranties do not diminish implied warranties, and shall not deprive the Owner of actions, rights and remedies otherwise available to him for the Contractor's failure to fulfill requirements of the Contract Documents. Periods of warranties shall not be interpreted as limitations on the time in which the Owner can pursue actions, rights or remedies.
 - 3. Coincidental product warranties, which are in conflict with the requirements of the Contract Documents, will be rejected.
 - 4. Warranties: Refer to individual Sections for requirements. (Submit on Form attached.)
 - 5. All warranties shall commence on the date of Substantial Completion or the date the maintenance and operating manuals are submitted, whichever date is the latest.
 - 6. All warranties shall cover all costs for necessary material and labor to promptly replace or restore the failing unit of work and other work damaged from its failure.

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Contract Closeout

Specifications

01 70 00-2

- C. Statutory and Non-Influence Affidavits (General Contractor and Subcontractor): Before final acceptance of the Work, the General Contractor shall furnish Statutory and Non-Influence Affidavits on the forms attached.
- D. Certificate of Recommendation of Acceptance: A certificate of Recommendation of Acceptance, for the project will be prepared by the Architect for the purpose of establishing a date when the project is substantially complete, identification of a punch list and determining actual damages or liquidated damages.
- E. Thereafter, the Owner will issue a signed Recommendation of Acceptance, which the Contractor shall immediately record with the Clerk of Court for the 19th Judicial District Court, Parish of East Baton Rouge, Louisiana and provide the recording information to the Architect and the Owner.
- F. Submit written notice to the Architect prior to final inspection of the project verifying that punch list items are complete and all closing documents are in order, as shown by the accompanying project close-out check off list, and that all final payments are in order and establishing a date of final acceptance.
- G. Record Documents and As-Built Record Drawings: (Refer to Section 01650). Submit digital (PDF) versions of each.

PART TWO - PRODUCTS: There are no products in this Section.

PART THREE - EXECUTION

3.01 FINAL CLEANING

- A. General: Special cleaning for specific units of work is specified in the Sections of Division 2 through 16.
- B. Provide final cleaning of the Work, at the time indicated, consisting of cleaning each surface or unit of work to the normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturers instructions for cleaning operations. The following are examples, but not by way of limitation, of the cleaning levels required:
 - 1. Clean project site (yard and grounds), including landscape, development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds clean of all debris that accumulated as a result of the construction.
- C. Time of Final Cleaning: Following Architect's certification of "Substantial Completion", and immediately before his "Final Acceptance" inspection.
- D. Removal of Protection:
 - 1. Except as otherwise indicated or requested by the Architect, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work or hazardous conditions during the remainder of the construction period.
- E. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site, or bury debris or excess materials on the Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from the site and dispose of in a lawful manner satisfactory to LSU solid waste disposal ordinance. Where extra materials of value remaining after completion of the associated work have become the Owner's property, dispose of these to Owner's best advantage as directed.

- 3.02 CONTINUING INSPECTIONS: Comply with the Owner's requests to participate in inspections at the end of each time period of such continuing commitments. Participate in the general inspection(s) of the work during the one-year period for correction after the date(s) of Substantial Completion.

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Specifications

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CHECK-OFF LIST

DOCUMENT	NO. OF COPIES	DATE RECEIVED
1. Statutory Affidavit	_____	_____
2. Contractor's Affidavit	_____	_____
3. Electronic As-Built Drawings and Record Documents	_____	_____
4. Fire Marshal Plan Review Letter	_____	_____
5. Punch list items completed	_____	_____
7. Recommendation of Acceptance	_____	_____
8. Record Owner's Notice of Acceptance	_____	_____
9. Consent of Surety to Final Payment, AIA G707	_____	_____
10. Contractors Affidavit of Payment of Debts & Claims	_____	_____
11. Letter of Final Completion by Architect	_____	_____
12. Certificate from Clerk of Court Status of Liens & Privileges Recorded	_____	_____
13. Certificate of Final Payment to Contractor	_____	_____
14. Fire Marshal Stamped Plans and Specs	_____	_____
15. O & M Manuals	_____	_____
16. Warranties	_____	_____

I certify that, being familiar with the Contract Documents for this project, to the best of my knowledge, the items checked off herein above constitute all that are applicable to this project.

Contractor's Signature
(For Submitting to the Architect)

Date Submitted to the Architect

Architect's Signature
(For Submitting to the Owner)

Date Submitted to the Owner

END OF SECTION

Section 01 73 29 Cutting and Patching

Specifications

01 73 29-1

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section Includes the following
 1. Summary: Definitions
 2. Submittals
 3. Safety and Quality Requirements
 4. Materials
 5. Inspection
 6. Preparation and Performance
- B. Refer to other Sections of these Specifications, including Divisions 21-28, for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
- C. Coordinate cutting and patching with demolition requirements. Demolition of selected portions of the building for alterations is included in Section 02 22 50.
- D. Definition: "Cutting and Patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
- E. All cutting and patching shall be the responsibility of the Mechanical, Electrical or other contractor requiring this work. All costs shall be paid by the Contractor needing this work.
- F. All patching shall be done by the General Contractor, who shall be reimbursed by the Contractor doing or requiring the cutting work. NOTE: Damaged plaster surfaces shall require the preparation by a (pre-approved by the Architect) and experienced plaster contractor.

1.02 SUBMITTALS

- A. Cutting and Patching Plan: Submit a proposal describing procedures ten days prior to the time cutting and patching will be performed. Include the following information, as applicable:
 1. Describe the extent of cutting and patching required and how it is to be performed.
 2. Describe anticipated results; include changes to structural elements and operating components and changes in the building's appearance.
 3. List products to be used and entities that will be perform Work.
 4. Indicate dates when cutting and patching is to be performed.
 5. List utilities that will be disturbed and duration.
 6. Approval to proceed does not waive the Owner's right to later require complete removal and replacement of Work found to be unsatisfactory.
 7. When cutting and patching of structural work involves the addition of reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with original structure to satisfy requirements.
- B. Samples of Cutting and Patching Materials as required by the Architect.

1.03 SAFETY AND QUALITY REQUIREMENTS

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load deflection ratio. Obtain approval from the Architect of the Cutting and Patching Plan before cutting and patching structural elements.
- B. Visual Requirements: Do not cut and patch work exposed on the building's exterior or in its occupied spaces, in a manner that would, in the Architect's opinion, result in lessening the building's aesthetic qualities or would result in substantial visual evidence of cut-and-patch work.

Section 01 73 29 Cutting and Patching

Specifications

01 73 29-2

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Except as otherwise indicated, use materials for cutting and patching that are identical or as close-there-to as existing materials with regard to visual effect. Use material for cutting and patching that will result in equal-or-better performance characteristics.
- B. Where and when directed by Architect, the Contractor shall attempt to remove and retain material noted to be (removed by demolition); this material, if in acceptable condition to the Architect, may be used in areas requiring patching.

PART 3 EXECUTION

3.01 INSPECTION

- A. Before the start of cutting work, meet at the work site with all parties involved in cutting and patching, including structural, mechanical and electrical trades. Coordinate trades, resolve areas of potential interference and conflict between the various trades.

3.02 PREPARATION AND PERFORMANCE

- A. General:
 - 1. Temporary Support: To prevent failure, provide temporary support of work to be cut.
 - a. Where cutting and patching of structural work involves the addition of reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with original structure to satisfy requirements.
 - 2. Protect other work during cutting and patching to prevent damage.
 - 3. Take precaution not to cut existing operating (i.e. utilities) and safety elements of the building.
 - 4. Cut the work using methods that are least likely to damage work to be retained or adjoining work.
 - 5. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 6. Patching: Patch with seams, which are durable and as invisible as possible. Comply with specified tolerances for the work.
 - 7. Where removal of walls or partitions extends from one finished area into another finished area, patch and repair floor and wall surfaces in the space to provide an even surface of uniform color and appearance.
 - 8. Where patch occurs in a smooth-painted-surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coats.
 - 9. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

END OF SECTION

Section 02 22 50

Minor Demolition For Remodeling

Specifications

02 22 50

PART 1 -GENERAL

- 1.01 SUMMARY - Section includes removal of designated doors and hardware; removal of designated construction; dismantling, cutting and alterations as indicated and necessary for the completion of the Work; disposal of materials and storage of designated removed materials; identification of utilities; salvaged items; and protection of items to remain as indicated. NOTE: Existing glass doors and hardware to be removed shall be turned-over to the Owner.
- 1.02 SCHEDULING
 - A. Schedule Work to coincide with construction.
 - B. Describe demolition removal procedures and schedule.
- 1.03 PROJECT CONDITIONS
 - A. Conduct demolition to minimize interference with adjacent and occupied building areas.
 - B. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer.
 - C. Do not resume operations until directed.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

- 3.01 PREPARATION
 - A. Provide, erect, and maintain temporary safeguards, including warning signs and barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.
 - B. Erect and maintain weatherproof closures for exterior openings.
 - C. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy at area designated on plans only.
 - D. Protect existing materials and existing improvements which are not to be demolished.
 - E. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.
 - F. Notify affected utility companies before starting work and comply with their requirements.
 - G. Mark location and termination of utilities.
 - H. Provide appropriate temporary signage including signage for exit egress.
- 3.02 DEMOLITION
 - A. Disconnect and/or remove, cap, and identify designated utilities within demolition areas.
 - B. Demolish in an orderly and careful manner. Protect existing improvements.
 - C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
 - D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
 - E. Remove temporary Work.

END OF SECTION

Section 03 30 00 Cast-In-Place Concrete

Specifications

03 30 00 1

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.02 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Pile caps
 - 3. Grade beams
 - 4. Foundation walls.
 - 5. Slabs-on-grade.
 - 6. Above grade slabs (cast-in-place or on metal decks)
 - 7. Building walls.
 - 8. Concrete stairs and fill for metal pan stairs.
 - 9. Concrete toppings
 - 10. CMU Grout Fill
 - 11. Grout for reinforced brick masonry walls
 - 12. Drilled piers and shafts.
- B. This specification section applies to all references in the contract documents to specification section 03 10 00, 03 20 00, or 03 30 00.
- C. Related Sections include the following:
 - 1. Division 31 Section "Earth Moving - Building Pad" for drainage fill under slabs-on-grade.

1.03 DEFINITIONS

- A. Cementitious Materials: Portland cement. None of the following are allowed in any concrete in this project: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: Submit a design mixture for each concrete mixture, proportioned on the basis of field experience or trial mixtures, or both, as required by ACI 318-14, chapter 26. Evidence of the ability of the proposed mixture to comply with concrete mixture requirements on the Drawings shall be included. The evidence shall be based on field test records or laboratory trial batches. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amount of mixing water to be withheld for later addition at Project site. The amount of water withheld shall not exceed five percent (5%) of the total batch water.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing but not limited to bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Reproductions made from contract drawings will not be accepted. Submit one (1) electronic print. Review of shop drawings by the Engineer will be for general compliance with contract documents.
 - 1. For reinforced concrete masonry walls, the shop drawings shall include a plan view layout of all filled cell locations, including filled cell locations above and below openings. Shop drawings shall include coordination of all embedded conduits, pipes, and sleeves within hollow cells of concrete masonry.
- D. Field quality-control test and inspection reports.
- E. The scope of the above submittals shall only include the items covered by this Section. Do not include items covered by other Sections such as site paving product data, site paving design mixtures, or site paving steel reinforcement shop drawings.



Section 03 30 00

Cast-In-Place Concrete

Specifications

03 30 00-2

1.05 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site (with video teleconferencing capabilities) and verify acceptable date with Architect and Engineer a minimum of one week prior to scheduling.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
 - 3. Contact vapor barrier manufacturer for preinstallation meeting and to coordinate review of the vapor barrier installation either by digital review or in person.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs qualified personnel on the Project, Flatwork Technicians with at least three (3) years experience, Finishers with at least three (3) years experience and a Supervisor with at least ten (10) years experience in concrete finishing and flatwork.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-- Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete for Buildings,"
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 3. ACI 318, "Building Code Requirements for Structural Concrete."
- G. Concrete Testing Service: Owner shall engage (and pay for) a qualified independent testing agency to perform material evaluation tests. Contractor shall engage and pay a qualified independent testing agency to design concrete mixtures.
- H. Materials and installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

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- I. For all concrete placement events, all steel reinforcement, other embedded items, and formwork shall be set and finalized a minimum of (3) three hours prior to the time of initial concrete placement to allow time for proper observation/inspection by the design team and the testing agency and time for resolution of any discrepancies.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops (if required): Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

- A. Forms for Exposed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
 - a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Forms for Unexposed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
 1. Form foundation elements as indicated on contract documents (typically placed in general notes of the structural plans).
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips (if required): Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 1. All reinforcing bars to be welded shall be ASTM A706, deformed.
- B. Plain-Steel Wire: ASTM A 82.
- C. Deformed-Steel Wire: ASTM A 1064.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Deformed-Steel Welded Wire Reinforcement: ASTM A 1064, flat sheet.

2.03 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars (if required): ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view or weather where legs of wire bar supports contact forms (or occur within 1-1/2 inches of surface), use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

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2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use either of the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II unless otherwise acceptable to Architect.
 - 2. Blended Hydraulic Cement: ASTM C 595, Type IL (10), 10% limestone substitution.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal for regular sand and gravel mixtures.
 - 2. Maximum Coarse-Aggregate Size: 0.5 inch nominal for sand and pea gravel mixtures. Use a #8 stone aggregate gradation per ASTM C 33 for pea gravel aggregate.
 - 3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable. Clean and not detrimental to concrete.

2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.06 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc; MiraSTOP.
 - b. CETCO; Volclay Waterstop-RX.
 - c. Concrete Sealants Inc.; Conseal CS-231.
 - d. Greenstreak; Swellstop.
 - e. Henry Company, Sealants Division; Hydro-Flex.
 - f. JP Specialties, Inc.; Earth Shield Type 20.

2.07 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape. The vapor retarder shall maintain a permeance of less than .01 perms as tested before and after mandatory conditioning tests (per ASTM E 1745 Section 7.1 and subparagraphs 7.1.2-5).
 - 1. Available Products:
 - a. Fortifiber Building Systems Group; Moistop Ultra.
 - b. Meadows, W. R., Inc.; Perminator.
 - c. Raven Industries Inc.; Vapor Block.
 - d. Reef Industries, Inc.; Griffolyn.
 - e. Stego Industries, LLC; Stego Wrap.
 - f. Inteplast Group; Barrier-Bac
 - 2. Refer to contract plan documents for minimum vapor retarder thickness in mils.
 - 3. Vapor proofing mastic: water vapor transmission rate per ASTM E 96 of 0.3 perms or lower.
 - 4. Seam tape: must have a water vapor transmission rate of 0.3 perms or lower in accordance with ASTM E 96

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2.08 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Curing compounds must be approved for use with types of floor finishes and sealers/hardeners specified in Contract Documents. Curing compound shall not interfere with bonding of floor covering. The following list of compounds does not indicate acceptance with the floor finishes utilized. Contractor shall only submit for approval curing compounds that are guaranteed not to interfere with bonding of any floor covering. Contractor assumes all responsibility for compliance of curing compounds with respect to this requirement.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Available Products:
 - a. Ashford Formula
 - b. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - c. Burke by Edoco; Aqua Resin Cure.
 - d. ChemMasters; Safe-Cure Clear.
 - e. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
 - f. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - g. Euclid Chemical Company (The); Kurez DR VOX.
 - h. Kaufman Products, Inc.; Thinfilm 420.
 - i. Lambert Corporation; Aqua Kure-Clear.
 - j. L&M Construction Chemicals, Inc.; L&M Cure R.
 - k. Meadows, W. R., Inc.; 1100 Clear.
 - l. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - m. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
 - n. Tamms Industries, Inc.; Horncure WB 30.
 - o. Unitex; Hydro Cure 309.
 - p. US Mix Products Company; US Spec Maxcure Resin Clear.
 - q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Available Products:
 - a. Ashford Formula
 - b. Anti-Hydro International, Inc.; AH Clear Cure WB.
 - c. Burke by Edoco; Spartan Cote WB II.
 - d. ChemMasters; Safe-Cure & Seal 20.
 - e. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
 - f. Dayton Superior Corporation; Safe Cure and Seal (J-18).
 - g. Euclid Chemical Company (The); Aqua Cure VOX.
 - h. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
 - i. Lambert Corporation; Glazecote Sealer-20.
 - j. L&M Construction Chemicals, Inc.; Dress & Seal WB.
 - k. Meadows, W. R., Inc.; Vocomp-20.
 - l. Metalcrete Industries; Metcure.
 - m. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
 - n. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
 - o. Tamms Industries, Inc.; Clearseal WB 150.
 - p. Unitex; Hydro Seal.
 - q. US Mix Products Company; US Spec Hydrasheen 15 percent
 - r. Vexcon Chemicals, Inc.; Starseal 309.

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2.09 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips (if required): ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Reglets (if required): Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots (if required): Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment (if required): Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment (if required): Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. The design mixtures for all exterior, exposed concrete shall provide a minimum of 4.5 percent entrained air.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - a. Do not use high-range water-reducing or super plasticizing admixtures in slabs.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, and concrete required to be watertight.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
 - 5. If more than one admixture is used in a concrete mix, assure that only compatible admixtures are used.
 - 6. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 - a. This requirement does not apply to lightweight concrete.

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- b. Air content for lightweight concrete shall comply with any fire-rated assembly requirements listed by Architect.
 - E. Maximum W/C Ratio: 0.50 and as required to achieve specified concrete strength.
 - 2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS
 - A. Design mixes to provide concrete with the properties as indicated on the structural drawings.
 - 2.13 FABRICATING REINFORCEMENT
 - A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
 - 2.14 CONCRETE MIXING
 - A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information. The time concrete is unloaded shall be recorded on each batch ticket.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
 - 2. Batch ticket information shall include information necessary to calculate total mixing water and the amount of water added by the receiver.
 - B. Project-Site Mixing is not allowed.

PART 3 EXECUTION

- 3.01 FORMWORK
 - A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
 - B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
 - C. Limit concrete surface irregularities, designated by ACI 117 and ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch for rough-formed finished surfaces.
 - D. Construct forms tight enough to prevent loss of concrete mortar.
 - E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
 - F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
 - G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
 - H. Chamfer exterior corners and edges of permanently exposed concrete, unless otherwise indicated.
 - I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
 - J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
 - K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
 - L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
 - M. Verify all foundation and slab edges for coordination with architectural drawings prior to placement of concrete.

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3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install and secure anchor rods prior to placing of concrete.
 - 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 4. Install dovetail anchor slots in concrete structures as indicated.
 - 5. Provide additional rebar if required to secure rebar dowels in proper location.
- B. Do not run any mechanical/electrical/plumbing pipes or conduit horizontally through concrete slabs, unless approved by the Engineer. These items shall also not bear continuously along grade beams and shall only cross perpendicular over top of grade beam in the concrete thickness below the slab at isolated locations.
- C. Do not run any mechanical/electrical/plumbing pipes or conduit through concrete footings, and/or pile caps unless approved by the Engineer. All mechanical/electrical/plumbing items shall be routed to avoid conflicts with concrete construction.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength but in no case shall forms be removed sooner than 10 days from placing of concrete for such elements.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. If vapor barrier is installed before the grade beam pour, seal vapor barrier to the inside face of grade beams along the entire vapor barrier perimeter using tape with a surface that creates a mechanical seal to freshly-place grade beam concrete, per manufacturer's instructions.
 - 2. If vapor barrier is installed after the grade beam pour, seal vapor barrier to the inside face of grade beams along the entire vapor barrier perimeter using tape and termination bar per manufacturer's instructions. Ensure that grade beam surface is clean and dry prior to adhering tape.
 - 3. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 4. Repair damaged areas by cutting patches of required vapor retarder, overlapping damaged area 6 inches and taping all four sides with approved tape.
 - 5. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 6. The vapor retarder shall be sealed at the perimeter.

3.05 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Maximum spacing of bar supports for slab/mat reinforcement shall be 48 inches on center or less as required to secure reinforcement during construction operations.
- E. Precast concrete blocks shall only be used to support reinforcement from the ground. Concrete blocks shall not be used for support of top reinforcement in concrete slabs or mats.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- G. Install bar reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap ends of bars as indicated on the structural contract drawings.
- H. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces as specified on drawings or a minimum of two full mesh if not otherwise specified. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.06

JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Do not continue reinforcement through sides of strip placements of floors and slabs (unless noted otherwise on drawings).
 - 2. Form joints as indicated on drawings. Do not use metal keyways
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces, where indicated on drawings.
 - 7. Construction joints shall not be placed in any slab areas with floor coverings prone to cracking, unless written approval is provided the Architect. When construction joints are allowed in slab areas with floor coverings prone to cracking, the contractor shall assure that joints are properly considered in floor covering installation as required to prevent reflective cracking.
- C. Isolation Joints in Slabs-on-Grade (if required): After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- D. Doweled Joints (as indicated on drawings): Install dowel bars and support assemblies at joints where indicated.

3.07

WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.
 - 1. Place at locations indicated on plans.
 - 2. Place at concrete construction joints below site grade in order to avoid water intrusion into interior space.

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- a. Place at wall to slab (or mat foundation) joints below site grade.
- b. Place at wall to wall joints below site grade.

3.08

CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
 1. All embedded items, including anchor bolts, rebar dowels, etc., shall be set prior to placement of concrete.
 2. For foundation elements, verify that water is not present in the excavation prior to placement of concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and in accordance with ASTM C94.
 1. Determine initial slump prior to any water addition at Project site and before any significant concrete discharge.
 2. Measure and record water added on Project site and resulting slump.
 3. The amount of water added shall not exceed the amount allowed in the approved design mixture.
 4. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 5. Do not exceed specified W/C ratio or slump per approved design mixture.
 6. Do not add water to concrete delivered in equipment not acceptable for mixing.
 7. Do not add water if more than 0.25 cubic yards of concrete has already been discharged from the mixer.
 8. All water added shall be under the pressure and direction of flow required to achieve uniformity in concrete. Immediately after addition of water, the drum or blades of the truck mixer or agitator shall be turned an additional 30 revolutions or more if necessary, at mixing speed, until uniformity of concrete is achieved.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

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2. Do not place concrete when temperature is 36 deg F or below or if temperature is expected to reach 36 deg F (or below) within 12 hours of the anticipated time for completing a concrete pour.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301, ACI 305R, and as follows:
 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
- G. All elevated concrete slabs in shored construction shall be placed with the minimum slab thickness indicated on the Drawings and shall also be constructed level as required to comply with flatness and levelness requirements as defined in ACI 117. All elevated concrete slabs in unshored construction (e.g. decks over non-composite steel beam and/or joist systems) shall be placed to a constant thickness matching the thickness indicated on the Drawings.
- H. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.09 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: (For formed concrete surfaces not exposed to view) As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: (For formed concrete surfaces exposed to view) As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Unless noted otherwise, all exposed concrete surfaces shall receive a rubbed finish. Consult with Project Architect to determine the type of rubbed finish prior to pouring of concrete. Apply one of the following to smooth-formed finished as-cast concrete as indicated or directed by Architect:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General:

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1. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
2. See architectural drawings for slab finish requirements or consult the Project Architect if finishes have not been supplied on the architectural drawings.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
 1. Apply scratch finish to surfaces to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated, to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - a. Finish surfaces to the following tolerances, see structural drawings
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
 2. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 1. Uniformly spread dampened slip-resistive aggregate over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

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- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints, unless noted otherwise in documents. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

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1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15

FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Provide special inspections in accordance with Chapter 17 of the International Building Code for concrete construction.
- B. Inspections:
 1. Steel reinforcement placement.
 2. Headed bolts and studs.
 3. Verification of use of required design mixture.
 4. Mixing and delivery time for concrete.
 - a. Record the time batched, time arrived, and the time unloaded for each batch of concrete.
 5. Concrete placement, including conveying and depositing.

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6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of discharge for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change or is questionable.
 - a. Determine initial slump prior to any water addition to concrete at Project site and before any significant concrete discharge.
 - b. Measure and record water added to concrete on Project site and resulting slump.
 - c. Record amount of water indicated on batch ticket allowed to be added.
 3. Slump for Self-Consolidating Concrete: ASTM C 1611/C 1611M-05; one test at point of discharge for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Visual Stability Index Value: Appendix X1.2 of ASTM C 1611/C 1611M-05; provide a Visual Stability Index Value for each composite sample taken for Self-Consolidating Concrete.
 5. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 7. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 8. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure five standard cylinder specimens for each composite sample.
 - b. Testing Agency shall be responsible for providing curing container for composite samples on Site as required for initial curing period and verifying that standard-cured composite samples are cured in accordance with ASTM C 31/C 31M. Testing Agency shall document method of initial curing.
 - c. The Contractor shall provide secured space, electrical power, and access for initial curing of test specimens.
 9. Compressive-Strength Tests: ASTM C 39/C 39M.
 - a. Test one specimen at 7 days, three specimens at 28 days, and hold one specimen for testing at 56 days, if necessary.
 - b. A compressive-strength test shall be the average compressive strength from a set of three specimens obtained from same composite sample and tested at age indicated.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work (illustrated via highlighting of elements on structural plans), design compressive strength at 28 days, concrete mixture proportions and materials, concrete unit weight, compressive breaking strength, and type of break for both 7- and 28-day tests. Deviations from the requirements of the Contract Documents shall be clearly identified and described on the reports.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

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13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness, per requirements on drawings, according to ASTM E 1155 within 72 hours of finishing.
- E. Environmental Controls: Rinsing out of the transit mix trucks, washing or wetting of concrete, site cleanup, or other activity related to water at the site shall be in strict conformance with all EPA requirements for the preventions of water runoff to storm water sewers or ditches.

END OF SECTION

Section 03 48 19
Precast Concrete Stair Treads
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PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Precast concrete stair treads/risers and landings, welded or bolted to supports on steel stairs.

B. Related Sections:

1. Section 055100 (05510) Steel Stairs: Stairs and stringers designed, fabricated and installed to meet applicable building codes, including weld plates for field attachment of Steptread welding plates.

1.2 REFERENCES:

A. American Society for Testing and Materials (ASTM):

ASTM C33	Concrete Aggregates
ASTM C139	Concrete Compressive Strength
ASTM C 144	Aggregate for Masonry Mortar
ASTM C 150	Portland cement
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C 642	Water Absorption, Density, Voids in Hardened Conc
ASTM C 666	Rapid Freeze/Thaw Resistance of Conc
ASTM C 979	Pigments for Integrally Colored Concrete
ASTM E303	Pendulum Slip Resistance

1.3 SUBMITTALS:

- A. Shop Drawings: Provide setting drawings and templates showing recommended installation of anchorage devices.
- B. Samples: Submit two 3" wide by full depth samples of each type of stair tread unit to show the full range of color and texture of treads and integral detectable warning stripes, for selection and approval. Apply sealer on one sample.
- C. Manufacturer's Installation Details: Submit complete.
- D. Warranty: Provide certified copies of manufacturer's product warranties.

1.4 SUBSTITUTIONS:

- A. Refer to Section () for procedures.

1.5 QUALITY ASSURANCE:

- A. Compliance with Regulations: Comply with requirements of state and local building codes and with rules and regulations relating to building accessibility.
- B. Manufacturer Qualifications: Company specializing in manufacture of precast concrete stair treads with a minimum of 10 continuous years of documented experience.
- C. Treads and connection shall be capable of supporting dead loads plus a uniform live load of 100 pounds per

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square foot.

- D. Pre-installation Conference: As directed by the Architect

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Deliver all materials to the installation site in the manufacturer's original packaging. Packaging shall contain manufacturer's name, customer name, order, identification number, and other related information.
- B. Handle and store stair treads, risers and landings in accordance with manufacturer's recommendations.

1.7 WARRANTY

- A. Provide warranty covering precast concrete stair treads, risers and landings against defects in material and workmanship for a period of 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURER:

- A. Stepstone, LLC; CalArc "Steptreads"
- B. D.C. Kerckhoff Co.
- C. Century Group
- D. Other Manufacturers: Submit for Prior Approval

2.2 MATERIALS:

- A. Stair treads shall be precast concrete, consisting of Portland cement, aggregate, color admixtures, and reinforcing, factory formed to profiles indicated.
 - 1. Portland Cement: ASTM C 150, Type III, high early strength.
 - 2. Aggregate: ASTM C 33.
 - 3. Color Admixture: By Davis Colors, or equal, as required to achieve color as selected.
 - 4. Aggregate for exposed aggregate surface: As selected.
 - 5. Reinforcement - Standard 2-1/2 inch Steptreads: Galvanized welded wire mesh, No. 7 and No. 10, 2 inch by 6 inch.
 - 6. Reinforcement - Long Span Steptreads: Galvanized 1/4" deformed rebar cage and 3 lengths of #4 galvanized rebar.
- B. Tread style:
 - 1. Closed Riser: (2-1/2 inch thickness)
 - a. Profile: Refer to drawing details.
- C. Provide starter nosings with integral detectable warning stripe to match tread color.
- D. Landings: Of size indicated or required, matching treads in color and texture.

2.3 COLORS AND FINISHES:

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- A. Colors: Manufacturer's standard selection for integral color admixture.
- B. Finishes: Walking surfaces of treads and landings shall have minimum coefficient of friction of 0.60, wet and dry.
 - 1. Sandblasted
- C. Factory Application of Sealer: Factory apply one coat of penetrating sealer to all surfaces of paving units. Sealer shall be non-staining, penetrating material, suitable for exterior or interior use, type which does not discolor or darken the surface.

1.4 PHYSICAL PROPERTIES:

- E. Compressive strength: Minimum 5,000 psi.
- F. Size 12" wide x 2-1/2" thick, length as required for width of stair.
- G. Weight:
 - 1. Closed Riser: 37.2 pounds per lineal foot at 12 inch depth.
 - 2. Landing Units: 30 pounds per square foot at 2-1/2 inches thick
- H. Water absorption: Not more than 6.0 % average, not more than 7.0 % for any individual unit for standard colors.
- I. Unit size: Within 3/16 inch of designated length, width and thickness.

1.5 ATTACHMENT ACCESSORIES:

- A. Welding to Steel stringers:
 - 1. 11 gauge galvanized weld plate, 4" x 7-1/4" for 2-1/2" thick Treads.
 - 2. Starter Nosings have a galvanized weld plate/angle (2-1/2" x 2-1/2" x 3/16")

1.6 FABRICATION:

- A. Stair treads, risers and landing planks shall be hand-made, wet-cast of cement conforming to ASTM C 150, Type III, and aggregates conforming to ASTM C 33.
- B. Reinforcement - Standard 2-1/2" thick Steptreads: Galvanized welded wire mesh, No. 7 and No. 10, 2 inch by 6 inch.
- C. Reinforcement – Landing Planks: Galvanized rebar cage.

1.7 SOURCE QUALITY CONTROL:

- A. Concrete for Steptreads and risers shall be tested frequently to assure that mixes provide units having not less than 5,000 psi compressive strength at 28 days (average test strength not less than 4,500 psi).
- B. Minor chips, hairline cracks, air voids and slight variations in color and finish are normal in precast concrete. When viewed in typical daylight illumination from a distance of 20 feet, minor cracks and air voids that cannot be seen with the naked eye are not grounds for rejection.

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Precast Concrete Stair Treads
Specifications

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PART 3 - EXECUTION

2.1 EXAMINATION:

- A. Verify that structural components of stairs are in place, aligned and level, within tolerances for proper installation of stair treads and risers, and required structural inspections have been completed.

2.2 INSTALLATION - GENERAL:

- A. Installation shall comply with requirements of applicable building codes and state and local jurisdictions.
- B. Install stair treads aligned, level and with uniform treads and risers throughout the extent of the stair. Where cutting is necessary, use powered masonry saw.
- C. Do not install stair treads having excessively stained, defaced, or damaged faces, edges, or corners where to remain exposed. Remove dust and dirt from stair tread units using oil-free compressed air.

2.3 INSTALLATION: WELDED TO STEEL STAIR SUPPORTS:

- A. Weld plates on Steptreads shall be welded to structural steel stairs as indicated on approved submittals.
- B. Welding shall comply with AWS D1.1, Structural Welding Code.

2.4 CLEANING:

- A. Clean exposed surfaces of stair treads and risers. Use cleaners appropriate for precast concrete finishes and colors. Acid based cleaners may alter finish and color.

2.5 SEALING:

- A. If a field-applied sealer is chosen to be added, test for compatibility to factory applied sealer before applying additional sealer.

3.7 COMPLETION:

- A. Protect precast concrete paving units from damage due to subsequent building operations.
- B. After installation and before completion, inspect precast concrete paving units for construction damage and obtain new precast concrete paving units if required.
- C. Immediately prior to final acceptance of project, clean precast concrete paving units.

END OF SECTION

SECTION 036000 - GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Portland cement grout.
2. Rapid-curing epoxy grout.
3. Nonshrink cementitious grout.

B. Related Requirements:

1. Section 031000 - Concrete Forming and Accessories: Form materials, waterstops, and accessories as required to form cast-in-place concrete and maintain structural integrity until stripping.
2. Section 033000 - Cast-in-Place Concrete: Cast-in-place or in-situ concrete for structural building frames, slabs on fill or grade, and other concrete components.

1.2 REFERENCE STANDARDS

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete for Buildings.
2. ACI 301M - Specifications for Structural Concrete (Metric).
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 318M - Metric Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
6. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
7. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
8. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):

1. CRD-C621 - Non-Shrink Grout.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer information regarding grout.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Manufacturer Instructions: Submit instructions for mixing, handling, surface preparation, and placing epoxy-type and nonshrink grouts.
- D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

- A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Maximum Conditions: Do not perform grouting if temperatures exceed manufacture recommendations.

- C. Minimum Conditions: Maintain minimum temperature as specified by manufacture, during, and after grouting, until grout has set.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT GROUT

- A. Portland Cement: Comply with ASTM C150, Type I and II.
- B. Water:
 - 1. Potable.
 - 2. No impurities, suspended particles, algae, or dissolved natural salts in quantities capable of causing:
 - a. Corrosion of steel.
 - b. Volume change increasing shrinkage cracking.
 - c. Efflorescence.
 - d. Excess air entraining.
- C. Fine Aggregate:
 - 1. Washed natural sand.
 - 2. Gradation:
 - a. Comply with ASTM C33.
 - b. Represented by smooth granulometric curve within required limits.
 - 3. Free from injurious amounts of organic impurities according to ASTM C40.
- D. Mix:
 - 1. Portland cement, sand, and water.
 - 2. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID-CURING EPOXY GROUT

- A. Manufacturers:
 - 1. Laticrete International, Inc.
 - 2. Sika Corporation.
 - 3. W.R. Meadows, Inc.
 - 4. Furnish materials according to LA DOTD standards.
- B. Description:
 - 1. High-strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.
 - 2. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids, and alkalis.

C. Performance and Design Criteria:

1. Compressive Strength:
 - a. 12,000 psi at seven days.
 - b. Comply with ASTM C579.
2. Minimum Tensile Strength:
 - a. 2,000 psi.
 - b. Comply with ASTM C307.
3. Coefficient of Expansion:
 - a. 30×10^{-6} inch per degree F.
 - b. Comply with ASTM C531.
4. Shrinkage:
 - a. None.
 - b. Comply with ASTM C827.

2.3 NONSHRINK CEMENTITIOUS GROUT

A. Manufacturers:

1. CGM, Incorporated.
2. Euclid Chemical Company (The); an RPM company.
3. Laticrete International, Inc.
4. QUIKRETE.
5. Sika Corporation.
6. Furnish materials according to LA DOTD standards.

B. Description:

1. Pre-mixed and ready-for-use formulation requiring only addition of water.
2. Nonshrink, non-corrosive, nonmetallic, non-gas forming, and no chlorides.

C. Performance and Design Criteria:

1. Certified to maintain initial placement volume or expand after set, and to meet following minimum properties when tested according to CRD-C621 for Type D nonshrink grout:
 - a. Setting Time:
 - 1) Initial: Approximately two hours.
 - 2) Final: Approximately three hours.
 - 3) Comply with ASTM C191.
 - b. Maximum Expansion: 0.10 to 0.40 percent.
 - c. Compressive Strength:

- 1) One-Day: 4,000 psi.
- 2) Seven-Day: 7,000 psi.
- 3) 28-Day: 10,000 to 10,800 psi.
- 4) Comply with CRD-C621.

2.4 FORMWORK

- A. As specified in Section 031000 - Concrete Forming and Accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify areas to receive grout.

3.2 PREPARATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Remove defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by brushing, hammering, chipping, or other similar means until sound and clean concrete surface is achieved.
- C. Roughen concrete lightly, but not to interfere with placement of grout.
- D. Remove foreign materials from metal surfaces in contact with grout.
- E. Align, level, and maintain final positioning of components to be grouted.
- F. Saturate concrete surfaces with clean water, and then remove excess water.

3.3 INSTALLATION

- A. Formwork:
 1. Construct leakproof forms anchored and shored to withstand grout pressures.
 2. Install formwork with clearances to permit proper placement of grout.
 3. As specified in Section 031000 - Concrete Forming and Accessories.
- B. Mixing:
 1. Portland Cement Grout:

- a. Use proportions of two parts sand and one part cement, measured by volume.
 - b. Prepare grout with water to obtain consistency to permit placing and packing.
 - c. Mix water and grout in two steps:
 - 1) Premix using approximately 2/3 of water.
 - 2) After partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing two to three minutes.
 - d. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
 - e. Do not add additional water after grout has been mixed.
2. Rapid-Curing Epoxy Grout:
- a. Mix and prepare according to manufacturer instructions.
3. Nonshrink Cementitious Grout:
- a. Mix and prepare according to manufacturer instructions.
4. Mix grout components in proximity to Work area and transport mixture quickly and in manner not permitting segregation of materials.

C. Placing of Grout:

1. Place grout material quickly and continuously.
2. Do not use pneumatic-pressure or dry-packing methods.
3. Apply grout from one side only to avoid entrapping air.
4. Do not vibrate placed grout mixture or permit placement if area is being vibrated by nearby equipment.
5. Thoroughly compact final installation and eliminate air pockets.
6. Do not remove leveling shims for at least 48 hours after grout has been placed.

D. Curing:

1. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or by using wet burlap method.
2. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
3. After grout has attained its initial set, keep damp for minimum three days.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Inspection and Testing:

1. Comply with ACI 301 and 318 and as specified in Section 014000 - Quality Requirements.
2. Submit proposed mix design of each class of grout to Engineer of Record for review prior to commencement of Work.

3. Tests of grout components may be performed to ensure compliance with specified requirements.

END OF SECTION 036000

Section 04 20 20

Brick Veneer

Specifications

04 20 20-1

PART 1 GENERAL

- 1.01 SECTION INCLUDES
 - A. Facebrick units.
 - B. Reinforcement, anchorage, and accessories (at both brick veneer and CMU single wythe walls).
- 1.02 REFERENCE
 - A. ACI 530.1 - Specifications for Masonry.
- 1.03 SUBMITTALS
 - A. Samples: Submit brick units, to illustrate color, texture and color range.
- 1.04 QUALITY ASSURANCE
 - A. Perform work in accordance with ACI 530 and ACI 530.1.
 - B. Brick shall comply with or exceed ASTM C-216 Grade SW Type FBX.
- 1.05 QUALIFICATIONS
 - A. Installer: Mason with minimum three years documented experience.
 - B. Manufacturer: NOTE – THIS SPECIFICATION REQUIRES THAT ALL MANUFACTURERS SPECIFIED AND REQUESTING PRIOR APPROVAL MUST SUBMIT A SAMPLE SELECTION PROPOSED TO MEET THE AESTHETIC REQUIREMENTS OF COLOR AND FINISH OF THIS SPECIFICATION; THIS SUBMITTAL SHALL BE AT LEAST 10 (TEN) DAYS PRIOR TO BID. Only approved manufacturer and it's approved product/model shall be noted in the Prior Approval of the Addenda; manufacturer's and products not specifically listed in the Addenda shall not be approved nor acceptable. Furthermore, failure of manufacturers (listed in this Section' original specification) to be listed in the addenda shall be considered to be revoked from the specification of this Section.
- 1.06 ENVIRONMENTAL REQUIREMENTS
 - A. Maintain materials and surroundings air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.
 - B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of work.
- 1.07 MOCKUP
 - A. Install 4 foot high by 6 foot wide panel illustrating pattern, bond, and blend of colors for Architect's approval of masonry materials prior to ordering all materials. Mock-up should accurately portray the color, blend, and size of brick that will be sent to the jobsite.
 - B. After all brick has been sent to the jobsite, construct a second mock-up wall size as necessary to incorporate examples of ALL conditions pertinent to the project; include bonding patterns, colored mortars, finished joint tooling, back-up construction, expansion joints & control joints (with sealant & backer rod), corners, headers, sills, horizontal reinforcing, anchorage to back-up construction, thru-wall flashing, cavity insulation, weeps, and any other special conditions for the project into masonry panel. The purpose of the sample panel is for the Contractor to show his understanding of all aesthetic and technical criteria related to masonry work for the Architect's approval prior to initiating actual work on the project. Masonry Work should not commence until the Architect and Owner have issued approval of the mock-up. Mock-up may remain as part of work if accepted.

PART 2 PRODUCTS

- 2.01 BRICK UNITS
 - A. Weight Classification: Normal Weight
 - B. Basis of Design: "Bengal Blend" modular by Cherokee Brick, to match existing brick

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Specifications

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- C. Size and Shape: Standard modular size 3 5/8" x 2 1/4" x 7 5/8" to match existing on existing building.
- D. Special shapes as required. Use solid units where cores (frogs) would otherwise be exposed to view.

2.02 REINFORCEMENT AND ANCHORAGE

- A. Coating: Hot dipped galvanized; 1.50 oz. psf
- B. Wire Gage: Standard weight.
- C. Type:
 - 1. Truss type; with pintle extensions at brick veneer assemblies - extension length of pintles to accommodate 1" board insulation and air space (re: drawings).
 - a. Manufacturer:
 - 1. Hohmann & Barnard: LoxAll Adjustable Eye-Wire; adjustable wall ties.
 - 2. Dur-O-Wal.
 - 2. Dovetail, slotted; extension length to accommodate air space (re: drawings).
 - a. Manufacturer:
 - 1. Hohmann & Barnard: LoxAll; adjustable wall ties.
 - 2. Dur-O-Wal: D/A 210 with D/A 701.

2.03 MORTAR AND GROUT

- A. Mortar/Grout: Type N; color to match existing building grout; equal to Holcim, 200 Ivory Buff – other manufacturer's grout shall be required to custom tint as necessary.

2.04 FLASHINGS

- A. Copper 10 oz./ sq. ft. (corrugated) or 5 oz./sq. ft. laminated between glass fabrics (vinyl or rubber materials are not acceptable).
- B. Set flashing projected 1/2" beyond outside face of exterior wythe, extend through cavity, rising no less than 8" and terminate at depth of 4" into bed joint of interior wythe. Neatly trim excess from exterior wythe joint after architect has approved installation.
- C. Extend flashing minimum 8" beyond each side of opening; form end dams by turning up material minimum 2" each end.
- D. End laps: minimum 6 inches, sealed with flashing adhesive
- E. Install mortar break diagonally on top of flashing to ensure that the mortar droppings are broken up and deflected away from the weep holes

2.05 ACCESSORIES

- A. Joint Filler: Closed cell rubber oversized 50 percent to joint width; self-expanding.
- B. Weeps: preformed corrugated plastic, typical; plastic tube-type at sill weeps.
- C. Mortarnets or gravel at bottom of masonry shelf.

PART 3 EXECUTION

3.01 COURSING

- A. Brick Units:
 - 1. Bond: Running; bond deviations where shown on drawings
 - 2. Pattern: See elevations of drawings for pattern requirements
 - 3. Coursing: 3 courses per 8".
 - 3. Mortar Joints: Tooled slightly concave; sled runners on horizontal joints

3.02 WEEPS

- A. Install weeps at dampcourse, sills, and lintels at a minimum of 24" o.c.

3.03 CONTROL AND EXPANSION JOINTS

- A. Install control and expansion joints where indicated on plans; keep joint free of mortar and foreign matter.
- B. If size is not indicated in the drawings, bring to the attention of the Architect.

Section 04 20 20 Brick Veneer

Specifications

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- C. Do not span expansion joints with reinforcement or anchorage.
- 3.04 REINFORCEMENT AND ANCHORAGE (INCLUDING SINGLE WYTHE CMU WALLS)
 - A. Install horizontal joint reinforcement 16" o.c.; vertical reinforcement 16" o.c.
 - B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
 - C. Place joint reinforcement continuous in first and second joint below top of walls.
 - D. Lap joint reinforcement ends minimum 6 inches.
 - E. Install 2" wide by 30" metal lath strips (at 16" o.c.) at CMU intersections and control joints; also provide same to span at brick veneer control joints.
 - F. Provide 1 1/2" wide by 30" long by 1/4" thick metal strap anchors at 48" o.c vertically at CMU control joints and intersections; bend last 2" of each end of anchor 90° and set in grouted cells.
- 3.05 MASONRY FLASHINGS
 - A. Extend flashings horizontally at foundation walls, above ledge or shelf angles and lintels, at bottom of walls.
 - B. Turn flashing up (under insulation or sheathing board) minimum 8 inches and bed into mortar joint of masonry.
 - C. Lap end joints minimum 6 inches and seal watertight.
 - D. Turn flashing, fold, and seal at corners, bends, and interruptions.
 - E. Provide end dams at sill and head flashings.
 - F. Install gravel or mortarnets at cavity at to top of second course above dampcourse flashing to prevent mortar spillage from clogging weepholes.
- 3.06 SURFACE TREATMENT
 - A. Tool joints to match those of existing brick veneer at existing new Athletic buildings.
- 3.07 TOLERANCES
 - A. Maximum Variation from Unit to Adjacent Unit: 1/32 inch.
 - B. Maximum Variation from Plumb: 1/4 inch, total.
 - C. Maximum Variation from Level Coursing: 1/8 inch in 3 ft. and 1/4 inch in 10 ft.
 - D. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- 3.08 CLEANING
 - A. Remove excess mortar and mortar smears.
 - B. Clean soiled surfaces with cleaning solution.
- 3.09 PROTECTION
 - A. Secure 24" wide plastic and/ or mulch at base of building to protect brickwork from mud staining and other construction splatters; protection to remain until hardscape/ landscape is established.

END OF SECTION

Section 04 22 00 Concrete Unit Masonry

Specifications

04 22 00-1

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Concrete masonry unit for load bearing and non-load bearing walls.
 - 2. Through-wall flashing
- B. Products installed but not furnished under this Section include the following:
 - 1. Sheet Metal Flashing and Trim is included in Section 07 60 00.
 - 2. Steel Doors and Frames are included in Section 08 11 13.
- C. Provide concrete masonry units that develop installed compressive strength of 1500 psi, min.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Contract Conditions and Division 1 Spec Sections:
 - 1. Product data for each different masonry unit, accessory, and other product indicated.
 - 2. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, bent bars, and arrangement of reinforcement.
 - 3. Samples for verification purposes of the following:
 - a. Material certificates, signed by manufacturer and Contractor certifying that each material complies with requirements for:
 - i. Mortar, including name of manufacturer, brand, type, and weight slips at time of delivery.
 - ii. Reinforcing bars.
 - iii. Anchors, ties, and metal accessories.
 - 4. Cold-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
 - 5. Hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.
 - 6. Qualification data for firms to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners, and other information specified.

1.04 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except as otherwise indicated.
- B. Single-Source Responsibility for Masonry Units: Obtain concrete masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality and color, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- D. Field-Constructed Mock-Ups: Prior to installation of concrete masonry, erect sample wall panels to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:
 - 1. Locate mock-ups on site as directed by Architect.
 - 2. Build mock-ups in sizes of approximately 4 feet long by 4 feet high by full thickness, including face and backup wythes as well as accessories.
 - 3. Notify Architect (1) week prior to dates and times when mock-ups will be erected.
 - 4. Protect mock-ups from the elements with weather-resistant membrane.
 - 5. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit masonry construction.
 - 6. When directed, demolish and remove mock-ups from Project site.
- E. Pre-installation Conference: Conduct conference at Project site, to comply with requirements of Division 1 Section "Project Meetings."

Section 04 22 00 Concrete Unit Masonry

Specifications

04 22 00-2

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.
- C. Store cementitious materials off the ground, under cover, and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.06 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
- B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- C. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.
- E. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
- F. Protect sills, ledges, and projections from mortar droppings.
- G. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.
- H. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
 - 1. Do not lay masonry units that are wet or frozen.
 - 2. Remove masonry damaged by freezing conditions.
- I. Hot-Weather Construction: Comply with referenced unit masonry standard.

1.07 COORDINATION

- A. Coordinate installation of other sections (brick, insulation board, soffits, metal panels, louvers, conduit, plumbing, F.E. cabinets, board insulation, etc.).

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.
- B. CONCRETE MASONRY UNITS
 - 1. General: Comply with requirements indicated below applicable to each form of CMU
 - a. Provide special shapes and finishes where indicated and as follows:
 - i. For lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 - b. Size: Provide concrete masonry units complying with requirements indicated below (or as specifically shown on plan) for nominal sizes, manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
 - i. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N and as follows:
 - 1) 8 inch x 8 inch x 16 inch stretcher block with regular or plain ends as required by conditions.
 - 2) 8 inch x 8 inch x 16 inch U-block at lintels and bond beams.
 - 3) 16 inch x 8 inch x 8 inch U-block cut to match roof slopes at locations indicated.
 - 4) 6 inch x 8 inch x 16 inch stretcher blocks where shown on plan.
 - 5) Use 4 inch, 8 inch, and 12 inch units where so indicated in drawings.
 - c. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 2.5 ksi.
 - d. Weight Classification: Light weight.

Section 04 22 00 Concrete Unit Masonry

Specifications

04 22 00-3

2.02 MORTAR

- A. General: Provide field mixed or proprietary mason's mix conforming to the same requirements as field mixed mortar conforming to ASTM C270, Type N.
 - 1. Portland Cement shall conform to ASTM C150, gray color.
 - 2. Masonry Cement: ASTM C91, Type N, "Magnolia Mason's Mix", "Atlas Masonry Cement", or "Lone Star Masonry Cement"
 - 3. Hydrated Lime shall conform to ASTM C207, Type S.
 - 4. Aggregate shall be fine masonry sand conforming to ASTM C144.
 - 5. Quicklime: ASTM C5, non-hydraulic type, slacked in accordance with manufacturer's directions.
 - 6. Non-staining Portland Cement: ASTM C150, Type I, containing not more than .03 percent of water soluble alkali, and shall not stain other materials and surfaces with which it is in contact. Cement shall be gray unless otherwise hereinafter specified.
 - 7. Water shall be clean and drinkable.
- B. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142, Type RS.
- C. Mortar Color: Standard Gray
- D. Mortar Mixes
 - 1. Mortar for load-bearing walls and partitions: ASTM C270, Type S utilizing the Proportion Method comprised of one (1) part Portland Cement, 1/4 part hydrated lime or lime putty, and three (3) parts sand; or one (1) part Portland Cement, one (1) part Type II masonry cement and six (6) parts sand.

2.03 REINFORCING STEEL

- A. General: Provide reinforcing steel complying with referenced unit masonry standard and this Section.
- B. Reinforcing Bars: Deformed billet steel complying with ASTM A 615, Grade 60.
- C. Interior Partitions – Single Wythe Joint Reinforcement: Truss type hot-dipped galvanized after fabrication, cold drawn steel conforming to ASTM A82. No. 9 side rods with No. 9 inch cross ties; truss single width manufactured by Dur-O-Wall
- D. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed bars, unprotected finish. Corner ties and strap anchors: No. 4 hooked ties at each course with vertical bars in grouted cells

2.04 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2-cup dry measure) and laundry detergent (1/2-cup dry measure) dissolved in one gallon of water.

2.05 ACCESSORIES

- A. Single Wythe Joint Reinforcement: ASTM A951/A951M; truss type; steel; 0.188 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.
- B. Multiple Wythe Joint Reinforcement: Refer to Brick Veneer Section. Coordinate with Brick.
- C. Reinforcing Steel: specified in Section 03 20 00
- D. Strap Anchors: equal to Dur-O-Wall DA301Z hot dip galvanized.
- E. Anchor Rods: ASTM A307; Grade C; J-shaped or L-shaped; complete with washers and heavy hex nuts; sized for minimum 15 inch embedment; galvanized finish.
 - 1. Hot-Dipped Galvanizing: ASTM A153/A153M.
 - 2. Mechanical Galvanizing: ASTM B695; Class 55.
- F. Preformed Control Joints: Rubber; Furnish with corner and tee accessories, heat fused joints.
- G. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding
- H. Steel Lintels: size as indicated on Drawings, hot-dip galvanized.

2.06 SOURCE QUALITY CONTROL

- A. Concrete Masonry Units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of CMU.
- B. Do not proceed until unsatisfactory conditions have been corrected.

Section 04 22 00 Concrete Unit Masonry

Specifications

04 22 00-4

- C. Preinstallation Meeting: Three days prior to start of CMU installation, masons shall meet with Architect and review the mason's construction plan (on a clean, marked-up sheet). Construction plan shall include all locations (noted in red ink) of where control joints will be located (indicate in elevations as well). Plan shall also include embedded flashing locations for other associated materials including, but not limited to, insulation board, brick veneer, metal panels, stucco, etc.

3.02 INSTALLATION, GENERAL

- A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.
- B. Thickness: Build cavity walls to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- C. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.
- E. Integrate joint reinforcement and brick masonry veneer ties.

3.03 CONSTRUCTION TOLERANCES

- A. Comply with construction tolerances of referenced unit masonry standard.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- D. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond. Do not tooth. Clean exposed surfaces of set masonry and remove loose masonry units and mortar prior to laying fresh masonry.
- E. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings, in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with concrete.
 - 3. For starting course on footings where cells are not filled with concrete, spread out full mortar bed including areas under cells.
- B. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
 - 1. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
 - 2. Nonbearing Interior Partitions: Build full height of story to underside of or roof structure, unless indicated otherwise.

3.06 CAVITIES/AIR SPACES

- A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush.

3.07 LINTELS

- A. Install steel lintels where indicated.
- B. Coordinate bedding of masonry flashings as is indicated in drawings and is industry standard
- B. Provide masonry lintels where shown and wherever openings of more than 2'-0" for block size units are shown.

Section 04 22 00 Concrete Unit Masonry

Specifications

04 22 00-5

1. Provide formed-in-place masonry lintels.
 2. Provide temporary support for formed-in-place lintels.
 3. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout.
 - a. Reinforce units with 2 #4 deformed bars, minimum, unless otherwise indicated.
 - b. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.
 - c. Fill block with concrete to full depth of 8 inch high block, unless otherwise indicated to be filled to 16 inches.
- D. Where expansion and control joints are required, provide joints each side of wall with sealant specified in Section 07 92 00, offset control joint to align with end of lintels and continue up to termination of CMU.
- 3.08 JAMBS
- A. Provide concrete in jamb cells at all masonry openings; reinforcement continuous from concrete slab, through jamb, and up into lintel piece.
1. Provide (1) #4 rebar in each jamb, unless noted otherwise.
 2. Hook into concrete slab 12"; lap slab rebar and jamb rebar 12", minimum.
- 3.09 FIELD QUALITY CONTROL
- A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
- B. Mortar properties will be tested per property specification of ASTM C 270.
- C. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.
- 3.10 REPAIRING, POINTING, AND CLEANING
- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: Joints shall have tooling to match existing on campus. During the tooling of joints, enlarge any voids or holes and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - a. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
- E. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.
- 3.11 REQUIREMENTS FOR MASONRY CONSTRUCTION IN HOT AND COLD WEATHER
- A. Refer to table on following page:

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	Temperature	Preparation Requirements (Prior to Work)	Construction Requirements (Work in Progress)	Protection Requirements (After Masonry Is Placed)
Hot Weather	Above 115 °F or 105 °F with a wind velocity over 8 mph (46.1 °C or 40.6 °C with a 12.9 km/hr wind)	Shade materials and mixing equipment from direct sunlight. Comply with hot weather requirements below.	Use cool mixing water for mortar and grout. Ice must be melted or removed before water is added to other mortar or grout materials. Comply with hot weather requirements below.	Comply with hot weather requirements below.
	Above 100 °F or 90 °F with 8 mph wind (above 37.8 °C or 32.2 °C with a 12.9 km/hr wind)	Provide necessary conditions and equipment to produce mortar having a temperature below 120 °F (48.9 °C). Maintain sand piles in a damp, loose condition.	Maintain mortar and grout at a temperature below 120 °F (48.9 °C). Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar. Maintain mortar consistency by retempering with cool water. Use mortar within 2 hr of initial mixing.	Fog spray newly constructed masonry until damp, at least three times a day until the masonry is three days old.
Normal Weather	100 °F to 40 °F (37.8 °C to 4.4 °C)	Normal Procedures.	Normal Procedures.	Normal Procedures.
Cold Weather	40 °F to 32 °F (4.4 °C to 0 °C)	Do not lay masonry units having either a temperature below 20°F (-6.7°C) or containing frozen moisture, visible ice, or snow on their surface. Remove visible ice and snow from the top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.	Heat mixing water or sand to produce mortar between 40 °F (4.4 °C) and 120 °F (48.9 °C). Do not heat water or aggregates used in mortar or grout above 140 °F (60 °C). Heat grout materials when their temperature is below 32 °F (0 °C).	Completely cover newly constructed masonry with a weather-resistive membrane for 24 hr after construction.
	32 °F to 25 °F (0 °C to -3.9 °C)	Comply with cold weather requirements above.	Comply with cold weather requirements above. Maintain mortar temperature above freezing until used in masonry. Heat grout materials so grout is at a temperature between 70 °F (21.1 °C) and 120 °F (48.9 °C) during mixing and placed at a temperature above 70 °F (21.1 °C).	Comply with cold weather requirements above.
	25 °F to 20 °F (-3.9 °C to -6.7 °C)	Comply with cold weather requirements above.	Comply with cold weather requirements above. Heat masonry surfaces under construction to 40°F (4.4°C) and use wind breaks or enclosures when the wind velocity exceeds 15 mph (24 km/h). Heat masonry to a minimum of 40°F (4.4°C) prior to grouting.	Completely cover newly constructed masonry with weather-resistive insulating blankets or equal protection for 24 hr after completion of work. Extend time period to 48 hr for grouted masonry, unless the only cement in the grout is Type III portland cement.
	20 °F and Below (-6.7 °C and Below)	Comply with cold weather requirements above.	Comply with cold weather requirements above. Provide enclosure and heat to maintain air temperatures above 32 °F (0 °C) within the enclosure.	Maintain newly constructed masonry temperature above 32°F (0°C) for at least 24 hr after being completed by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend time period to 48 hr for grouted masonry, unless the only cement in the grout is Type III portland cement.
Preparation and Construction requirements are based on ambient temperatures. Protection requirements, after masonry is placed, are based on mean daily temperatures.				

END OF SECTION

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PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Architectural cast stone veneer panels and pieces where indicated in drawings.
- B. Scope – All labor, materials and equipment to provide the cast stone as shown on drawings:
 - 1. Manufacturer shall furnish and deliver cast stone covered by this specification.
 - 2. Installing contractor shall unload, store, furnish all anchors, set, adjust and clean cast stone.

1.02 RELATED SECTIONS

- A. Section 07 92 00 - Joint Sealers.

1.03 REFERENCES

- A. ACI 318 - Building Code Requirements for Reinforced Concrete.
- B. ASTM C 33 - Standard Specification for Concrete Aggregates.
- C. ASTM C 150 - Standard Specification for Portland Cement.
- D. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- E. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.
- F. ASTM C 642 - Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete.
- G. ASTM A 615/A 615M - Specification for Deformed, Plain Billet-Steel Bars, Concrete Reinforcement.
- H. ASTM C 666 - Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- I. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete.
- J. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- K. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- L. ASTM C 1364 - Standard Specification for Architectural Cast Stone.
- M. ASTM D 2244 - Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.
- N. Cast Stone Institute Technical Manual. (Latest Edition)

1.04 DESIGN REQUIREMENTS

- A. Cast Stone: Highly refined architectural concrete stone product manufactured to simulate fine grain texture of natural stone.
- B. Panels greater than 1'-0" wide shall be reinforced along their width; minimum reinforcement shall be 0.25% of the cross section area of the panel.

1.05 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Test results of cast stone components made previously by manufacturer.
- C. Shop Drawings: Include plan, section, and elevation layout, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotation of components, and their locations in project.
- D. Verification Samples: Pieces of actual cast stone components, 12 inches (305 mm) square, illustrating range of color and texture to be anticipated in components furnished for project.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A current producer member of Cast Stone Institute, with a minimum of 5 years of experience in producing cast stone of types required for project.
 - 1. Plant shall have adequate capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the Work.
 - 2. Products produced by plant and exposed to weather shall exhibit satisfactory appearance.
- B. Standards: Comply with requirements of Cast Stone Institute Technical Manual.
- C. Mock-Up: Provide full size cast stone components for installation in mock-up of each type of element. Approved mock-up will become standard for appearance and workmanship.
 - 1. Mock-up (if accepted) may remain as part of the completed Work.
 - 2. After mock-up is reviewed and accepted by architect, deliberately chip a corner, and patch with manufacturer's patch kit for approval of patch; if patch cannot be made acceptably, damaged, chipped stone installed will not be accepted to be patched.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration.

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2. Protect corners from damage.
 3. Number each piece individually to match shop drawings and schedules.
 - B. Storage:
 1. Store cast stone components and installation materials in accordance with manufacturer's instructions.
 2. Store cast stone components on pallets with non-staining, waterproof covers.
 3. Ventilate under covers to prevent condensation.
 4. Prevent contact with dirt.
 - C. Handling: Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- 1.08 SCHEDULING
- A. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the Work.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
- A. Advanced Cast Stone, Inc.
 - B. Midwest Cast Stone
 - C. AHI Supply, Inc.
- 2.02 ARCHITECTURAL CAST STONE
- A. Cast Stone: ASTM C 1364.
 1. Casting Method: Manufacturer's standard
 2. Compressive Strength, ASTM C 1194: 6,500 psi minimum at 28 days.
 3. Absorption, ASTM C 642 or C 1195: 6 percent maximum at 28 days.
 - B. Surface Texture:
 1. Fine grained texture, similar to natural stone.
 2. No bugholes, air voids, or other surface blemishes.
 - C. Color and Finish:
 1. Finish: Submit samples to Architect for selection.
 2. Color shall be selected by Architect of manufacturer's standard, but not less than (6) colors.
 - D. Shapes and Sizes
 1. Thickness: Minimum of 1 ½", but applicable to panel dimension and use
 2. Edges and Profiles: as indicated in drawings.
- 2.03 CAST STONE MATERIALS
- A. Portland Cement: ASTM C 150, Type I, white or gray as required to match Architect's sample.
 - B. Coarse Aggregate: ASTM C 33, except for gradation; granite, quartz, or limestone.
 - C. Fine Aggregate: ASTM C 33, except for gradation; natural or manufactured sands.
 - D. Pigments: ASTM C 979, inorganic iron oxides.
 - E. Admixtures: ASTM C 494. Integral water repellants and other chemicals for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 - F. Water: Potable.
 - G. Reinforcing bars: ASTM A 615/A 615M, galvanized or epoxy coated.
- 2.04 MORTAR MATERIALS
- A. Mortar: ASTM C 270, Type N.
- 2.05 ACCESSORIES
- A. Anchors: Non-corrosive type, sized for conditions, Type 304 stainless steel.
 - B. Sealant: As specified in Section 07 92 00.
 - C. Cleaner:
 1. Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces.
 2. Expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

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2.06 FABRICATION

- A. Shapes: Unless otherwise indicated on drawings, provide:
 - 1. Suitable wash on components with exposed top surfaces.
 - 2. Drips on projecting components, wherever possible.
- B. Reinforcement: Provide reinforcement as necessary to withstand handling, structural stresses.
 - 1. Comply with ACI 318.
 - 2. Provide reinforcement of a minimum of 0.25 percent of cross-section area to panels which exceed 12" in width.
 - 3. Minimum reinforcing cover shall be twice the diameter of the bars.
- C. Curing:
 - 1. Cure cast stone components with a direct fired steam generator at a minimum temperature of 105 degrees F (41 degrees C) for a minimum of 6 hours, within 12 hours of fabrication.
 - 2. Cure cast stone components in presence of carbon monoxide and carbon dioxide to promote carbonation at surface, to minimize efflorescence.
- D. Finishing: Remove cement film from exposed surfaces before packaging for shipment.
- E. Tolerances: Fabricate cast stone components within specified tolerances.
 - 1. All Dimensions: Plus or minus 1/8 inch (3 mm).
 - 2. Maximum Bow, Camber, or Twist: Length/360.
 - 3. Other tolerances as per Cast Stone Institute Technical Manual.

2.07 SOURCE QUALITY CONTROL

- A. Testing: Test compressive strength and absorption of specimens selected at random.
 - 1. Test in accordance with referenced testing standards.
 - 2. Select samples at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable. Do not begin installation until unacceptable conditions have been corrected.
- B. Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.02 INSTALLATION

- A. General: Install cast stone in conjunction with other substrate construction. Install in accordance with manufacturer's recommendation. Do not install on any substrate not acceptable to manufacturer.
- B. Setting:
 - 1. Drench cast stone components with clear, running water immediately before installation.
 - 2. Do not use pry bars or other equipment in a manner that could damage cast stone.
 - 3. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 - 4. Set cast stone components in a full bed of mortar, unless otherwise detailed.
 - 5. Fill vertical joints with mortar.
 - 6. Make all joints 1/4 inch (6.33 mm), except as otherwise detailed.
 - 7. Leave head joints in copings and similar components open for sealant.
 - 8. Rake mortar joints 3/4 inch (19 mm) for pointing. Sponge face of each stone to remove excess mortar.
 - 9. Tuck point joints to a slight concave profile.
- C. Sealant Joints:
 - 1. Comply with requirements of Section 07920.
 - 2. Prime ends of cast stone components, insert properly sized foam backing rod, and install sealant using sealant gun.
 - 3. Provide sealant joints at following locations and as otherwise detailed:
 - a. Cast stone components with exposed tops.
 - b. Joints at relieving angles.
 - c. At control and expansion joints.

3.03 TOLERANCES

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- A. Installation Tolerances: Comply with requirements of Cast Stone Institute Technical Manual for installation tolerances.
 - 1. Variation from Plumb: Do not exceed 1/8 inch in 5 feet or 1/4 inch in 20 feet or more.
 - 2. Variation from Level: Do not exceed 1/8 inch in 5 feet (3 mm in 1.5 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.
 - 3. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch (3 mm) or 1/4 of nominal joint width, whichever is greater.
 - 4. Variation in Plane Between Adjacent Surfaces: Do not exceed 1/8-inch (3-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.
- 3.04 ADJUSTING
 - A. Surface Repair:
 - 1. Repair chipping, other surface damage noticeable when viewed in direct daylight at 20 feet.
 - 2. Repair with matching touchup material provided by manufacturer and in accordance with manufacturer's instructions.
 - 3. Repair methods and results to be approved by Architect.
- 3.05 CLEANING
 - A. In-Progress Cleaning:
 - 1. Clean cast stone components as work progresses.
 - 2. Remove mortar fins and smears before tooling joints.
 - B. Final Cleaning:
 - 1. Clean exposed cast stone, after mortar is thoroughly set and cured.
 - 2. Cleaner:
 - a. Wet surfaces with water before applying cleaner.
 - b. Apply cleaner to cast stone in accordance with manufacturer's instructions.
 - c. Remove cleaner promptly by rinsing thoroughly with clear water.
- 3.06 SEALING
 - A. Allow cleaning solution and stone to dry thoroughly before sealing.
 - B. Seal surfaces with solution approved by cast stone manufacturer.
 - C. Seal surfaces in accordance with cast stone manufacturer's instructions.
- 3.07 PROTECTION
 - A. Protect cast stone components from splashing and other damage.
- 3.08 INSPECTION AND ACCEPTANCE
 - A. Inspect by Cast Stone Institute Standards, Bulletin #36.

END OF SECTION

Section 05 12 00 Structural Steel Framing

Specifications

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PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Field-installed shear connectors.
 - 3. Grout.
- B. Related Requirements:
 - 1. Division 05 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
 - 2. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
 - 3. Division 05 Section "Metal Stairs."
 - 4. Division 09 painting Sections for surface preparation and priming requirements.

1.3 DEFINITIONS

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

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
- C. The general contractor is responsible for coordinating the structural steel shop drawing submittal with all other submittals for elements which attach to structural steel or have an effect on structural steel design or detailing. This includes, but is not limited to, elevators, mechanical/electrical equipment, steel joists, pre-engineered metal stairs, railings, medical equipment, suspended partitions, pre-engineered cold-formed metal trusses, sliding doors, suspended lights, glass storefront/curtainwall, roof davits, roll-up doors, guy wire supports, etc. Hold shop drawing production, ordering of material, fabrication, and other work associated with such elements as required until these other submittals are reviewed and approved. Provide separate submittals for these elements as required. Elevator steel shall be provided in a separate submittal. The general contractor shall coordinate between steel supplier and these other suppliers as required. Submit requests for information in advance of shop drawing production as required.
- D. Prior to shop drawing production, review contract documents for discrepancies, incomplete information, non-standard connections, or apparent undefined conditions in which additional information or clarification is required. Submit requests for information prior to detailing for shop drawings at these conditions.
- E. Verify size of floor/roof shaft openings (for elevators, stairs, mechanical, etc.) with other submittals/trades as required prior to detailing of associated steel framing at these locations.

1.5 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.



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- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include erection plans, sections, elevations, and details.
 - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data. Provide details of all non-standard connections not specifically indicated on the drawings for approval. Comply with all AISC minimum edge distance and spacing requirements.
 - 3. Include embedment Drawings.
 - 4. Include a layout plan for all embedment plates in concrete/CMU walls at cold-formed metal truss/open web steel joist support points. Layout plan shall be coordinated with approved submittal of cold-formed metal roof trusses/open web steel joists. Layout plan shall be provided in separate submittal as required.
 - 5. Include exact layout of all kicker braces which attach to open-web steel bar joists.
 - 6. Indicate size, material specification, surface preparation and coating for all members and components.
 - 7. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds when backing bars are to remain. Provide welding process and joint designation for all complete-joint-penetration and partial-joint-penetration welds.
 - 8. All required field welding shall be indicated on the erection drawings using erection details.
 - 9. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 10. All column piece drawings shall indicate the grid location of the column.
 - 11. Reproductions made from contract drawings will not be accepted.
 - 12. For structural-steel connections indicated to comply with design loads, include structural analysis data by the qualified professional engineer responsible for their preparation.
 - 13. Shop drawings shall be computer generated using three-dimensional detailing software.
 - 14. The final three-dimensional model shall be transmitted electronically to the Engineer along with submittal of shop drawings. Model is provided for information only. All comments from review will be made on 2D shop drawings. The three-dimensional model shall be submitted in IFC (.ifc) format. A three-dimensional model shall also be sent for all pre-engineered metal stairs.
 - 15. Allow 21 days for review of structural steel shop drawings, excluding delivery time to and from the contractor.
 - 16. On projects where submittals are processed electronically, provide Engineer with a minimum of one half-sized copy of shop drawings for office use only.
 - 17. For shop drawings that are marked "Make Corrections Noted", provide Architect/Engineer with an electronic record set of the shop drawings and three-dimensional model for informational purposes once all revisions are made.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code – Steel," for each welded joint qualified by testing, including the following:
 - 1. Power Source.
- D. Delegated-Design Submittal: For structural-steel connection indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Qualification Data: For Installer and fabricator.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with top coats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:

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1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 2. Direct-tension indicators.
 3. Tension-control, high-strength bolt-nut-washer assemblies.
 4. Shear stud connectors.
 5. Shop primers.
 6. Nonshrink grout.
 - F. Source quality-control test reports.
 - G. Survey of existing conditions.
 - H. Field quality-control and special inspection reports.
- 1.8 QUALITY ASSURANCE
- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
 - B. Comply with applicable provisions of the following specifications and documents:
 1. AISC 303.
 2. AISC 360.
 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
 - B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repacking and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturer's written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
 1. Select and complete connections using AISC 360.
- 2.2 STRUCTURAL-STEEL MATERIALS
- A. W-Shapes: ASTM A 992/A 992M.
 - B. Channels: ASTM A 992/A 992M.
 - C. Angles: ASTM A 572/A 572M, Grade 50.
 - D. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50.
 - E. Corrosion-Resisting Structural Steel: ASTM A 588/A 588M, Grade 50.
 - F. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.
 - G. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing.
 - H. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 1. Weight Class: Standard, unless otherwise noted on drawings.
 2. Finish: Black, except where indicated to be galvanized.
 - I. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirements S11.
 - J. Steel Forgings: ASTM A 668/A 668M.
 - K. Welding Electrodes: Comply with AWS requirements.

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- 2.3 BOLTS, CONNECTORS, AND ANCHORS
- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563, Grade C heavy hex carbon-steel nuts; and ASTM F 436, Type 1 hardened carbon-steel washers; all with plain finish.
 - B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852 (also referred to as ASTM A 325 Tension-Control), Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563, Grade C (or Grade DH if indicated to be galvanized) heavy hex carbon-steel nuts; and ASTM F 436, Type 1 hardened carbon-steel washers.
 - 1. Finish: Plain, except where indicated to be galvanized.
 - C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
 - D. Threaded and Nuted Anchor Rods (or Anchor Bolts): ASTM F 1554, Grade 55, weldable, straight.
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Plate Washers: ASTM A 36 carbon steel.
 - 3. Washers: ASTM F 436 hardened carbon steel.
 - 4. Finish: Plain, except where indicated to be galvanized.
 - E. Threaded Rods: ASTM A 36
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Washers: ASTM A 36 carbon steel.
 - 3. Finish: Plain, except where indicated to be galvanized.
 - F. Clevises: ASTM A 668, Class A.
 - 1. Clevis Pins: ASTM A108, Grade 1117.
 - 2. Dimensioning of clevises shall be in accordance with Table 15-4 of the AISC Steel Construction Manual, unless noted otherwise.
 - G. Turnbuckles: ASTM F 1145, Type 1, Grade 1, Class B.
 - 1. Dimensioning of turnbuckles shall be in accordance with Table 15-6 of the AISC Steel Construction Manual, unless noted otherwise.
 - H. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.
 - I. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.
- 2.4 PRIMER
- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
 - B. Primer: SSPC-Paint 25, zinc oxide, alkyd, linseed oil primer.
 - C. Primer chosen shall be compatible with any additional coatings required.
 - D. For exposed structural steel, refer to Division 09 sections
 - E. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 or ASTM A 780.
 - 1. Dry film shall have at least 94% metallic zinc by weight
 - 2. Coordinate with Division 09 Sections of field painting if exposed.
- 2.5 GROUT
- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 - 1. All grout shall have a minimum compressive strength of 5,000 psi at 28 days.
- 2.6 FABRICATION
- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
 - B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

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1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces. Do not thermally cut bolt holes in the field or enlarge holes by burning.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 1. Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes in the field or enlarge holes by burning.
 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- H. All reinforcing bars to be welded to structural steel shall be ASTM A706, deformed, and fabricated in accordance with CRSI's "Manual of Standard Practice."
- I. All clevises and turnbuckles shall be manufactured to meet the dimensions and load ratings shown in the AISC Steel Construction Manual.
- J. All reinforcing bars to be welded to structural steel shall be ASTM A706, deformed, and fabricated in accordance with CRSI's "Manual of Standard Practice."
- K.

2.7

SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Pretensioned.
 2. Use standard bolt holes. Slotted holes are not permitted unless indicated.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth for architecturally exposed structural steel members.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC 303 for mill material.
 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.8

SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches. This does not apply to columns.
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials. This does not apply to intumescent coatings.
 5. Galvanized surfaces.
 6. Top flanges of composite steel beams that are specified to have headed shear studs attached.

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- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).
- E. All structural steel shall be prepared in manner compatible with architectural requirements such as intumescent coatings, applied fire-proofing, high performance coatings, etc. Coordinate to verify compatibility between products chosen and/or methods of preparation. Identify any conflicts to Architect prior to fabrication of structural steel.

2.9

GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
 - 1. Fill vent holes and grind smooth after galvanizing.
 - 2. Galvanize steel lintels and shelf angles attached to structural frame and located in exterior walls.
 - 3. Galvanize steel exposed to weather, U.N.O.
 - 4. Galvanize all other steel specifically indicated on Drawings.
 - 5. Galvanize all anchor bolt assemblies for steel members outside building enclosure.
 - 6. Galvanized anchors and nuts shall be purchased from same supplier and shall be shipped preassembled.

2.10

SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 - 2. Contractor shall hire independent Testing Agency for inspection of shop welds and bolts at production facility. Owner's Testing Agency shall provide additional inspection of shop welds and bolts upon arrival to jobsite.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.

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2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- F. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 2. All grout shall be placed under steel column base plates and achieve 70% of its required 28-day strength prior to placement of concrete for elevated floors which are supported by the steel columns.
 3. Grout shall be placed with fluid consistency if column blockouts are used at ground floor slab.
 4. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 5. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.
- G. Do not use thermal cutting during erection.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

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- I. Do not cut holes in structural steel framing unless indicated on structural drawings.
- J. Headed Stud Anchors: Prepare steel surfaces as recommended by manufacturer of headed stud anchors. Use automatic end welding of headed stud anchors according to AWS D1.1 and manufacturer's written instructions. Welding shall develop full capacity of headed stud anchor.
- K. All structural steel diagonal brace members shall be set and attached to the steel frame prior to placement of concrete for elevated floors.
- L. Remove all factory piece markings (especially if welded on to the member) by grinding smooth on all elements to be exposed prior to field painting.
- M. All loose lintels supporting masonry or stone veneer shall be set such that the veneer has a minimum bearing width of 2-1/2 inches. Coordinate lintel placement with Architect at head of door/windows with veneer above.
- N. For members which provide shelf support of masonry or stone veneer, verify accuracy of alignment and elevation prior to permanently fastening. Contact Architect/Engineer if field adjustments to connections of members are required to accommodate tolerances.

3.4 FIELD CONNECTIONS

3.5 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned
 - 2. Provide and install a tension-control, high-strength bolt-nut-washer assembly for all bolts on field bolted connections.
 - 3. Use standard bolt holes. Slotted holes are not permitted unless indicated.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth for architecturally exposed structural steel connections.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC 303, "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 - 4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
 - 4. Verify all other applicable items as required per Chapter N of AISC 360.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspection.
- C. All inspection and tests shall be performed in accordance with Chapter N of AISC 360.
- D. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Welded Connections: Visually inspect field welds according to AWS D1.1. See structural drawings for additional requirements on weld inspection.

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1. In addition to visual inspection, test and inspect field welds according to AWS D1.1 and the following inspection procedures, at testing agency's option or as specified on structural drawings:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
 1. All corrections shall be submitted to the Project Architect and Engineer for review and approval. Correction work shall not proceed until approval has been provided.
 2. Significant deficiencies in construction which require substantial engineering to resolve may require the contractor to secure the services of a professional engineer at no additional cost to the owner. The Project Architect and/or Engineer of Record will determine if a contractor hired engineer is required depending on the severity of the deficiency and the extent of work involved.

3.7

REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780 and manufacturer's written instructions.
- B. Touchup Priming: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Remove all factory piece markings (especially if welded on to the member) by grinding smooth on all elements to be exposed prior to field touchup priming operations. Touchup prime all repaired spots that required field grinding and cleanup which damaged the shop priming.
- C. Touchup Painting: Cleaning and touchup painting for exposed steel are specified in Division 09 painting Sections.

3.8

MISCELLANEOUS STEEL

- A. Unless otherwise indicated on the structural drawings, provide angles, tubes, plates, channels, and other steel members shown on the architectural and connect with 1/4" fillet weld at all material interfaces. Unless otherwise indicated, the following assumptions shall be made regarding spacing and member size in order to establish an all-inclusive structural steel bid price. Plates-5/16", Cont. Bent Plate- 5/16", Angle- L5x5x3/8, Channel Horizontally Oriented- C12x30, Channel Vertically Oriented- C6x8.2, Wide Flange-W18x35, Tube-HSS 6x6x5/16. Members/pieces shown in section shall be assumed continuous unless otherwise noted. Spacing intervals of stiffeners, hangers, kickers, -30"OC. Columns W12x79." It is the contractor's responsibility to coordinate and verify all structural steel shapes indicated in architectural drawings, prior to bid.

END OF SECTION

Section 05 21 00 Steel Joist Framing

Specifications

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. Joist accessories.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Section 042200 "Concrete Unit Masonry" for installing bearing plates in Concrete unit masonry.
 - 3. Section 051200 "Structural Steel Framing" for associated steel framing work.

1.03 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings: Reproductions made from contract drawings will not be accepted. Submit one (1) electronic print. Review of shop drawings by the Architect/Engineer will be for general compliance with contract documents.
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.
 - 4. Indicate that joists are designed for all special loading as given on the structural drawings.
 - 5. All special loading shall be clearly identified and located on joist placement plan in shop drawings.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.
- F. Field quality-control reports.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.



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- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.08 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and/or masonry construction.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level, unless otherwise indicated.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.
 - b. Deflection limits above apply to all spans of joist, including cantilevered extensions.
 - 3. All special loads indicated on Drawings shall be in addition to allowable loads required by SJI for given span of joist.

2.02 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists and/or KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists. Deduct area of holes from the area of chord when calculating strength of member.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Camber joists according to SJI's "Specifications". Reduce camber at adjacent joists with varying lengths or at adjacent non-cambered structural steel beams as required prevent deck installation problems.
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.03 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Division 09 Painting Sections applicable to location and requirements of joist framing.

2.04 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

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Specifications

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- B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated. Provide ceiling extensions at all locations required to accommodate architectural detailing.
 - 1. Finish: Same as joist material.
- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Welding Electrodes: Comply with AWS standards.
- F. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.05 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework as per SJI minimum standards or as otherwise indicated on the drawings if the drawings indicate welds which exceed SJI welding standards. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- F. Install and connect L1-1/2x1-1/2x3/16 stiffening angles on each side of joist at all concentrated loads applied to joist in accordance with typical detail on structural plans. Weld each end of stiffening angles all around.

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- G. Do not make attachments to joist which induce twisting in the joist. All attachments shall be concentric to the joist member.

3.03

FIELD QUALITY CONTROL

- A. Testing Agency: Owner shall engage a qualified independent testing agency to perform tests and inspections and prepare test and inspection reports. Tests and inspection shall be in accordance with Chapter 17 of the International Building Code.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165/E 165M.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- E. Prepare test and inspection reports.
- F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.04

PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

Section 05 31 00 Steel Decking

Specifications

05 31 00-1

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Composite floor deck.
- B. Related Requirements:
 - 1. Division 03 Section "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Division 05 Section "Structural Steel" for shop- and field-welded shear connectors.
 - 3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 4. Division 09 painting Sections for repair painting of primed deck and finish painting of deck.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include plans showing layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
 - 2. Steel decking shop drawings shall not be submitted until structural steel framing shop drawings have been reviewed.
 - 3. For metal roof deck supported by pre-engineered metal trusses, the metal roof deck submittal will not be approved until the pre-engineered metal truss submittal is reviewed and approved.

1.04 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- D. Evaluation Reports: For steel deck.
- E. Field quality-control reports.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.



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Specifications

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PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.02 ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Canam Steel Corporation.
 - 2. Epic Metals Corporation.
 - 3. New Millennium Building Systems, LLC.
 - 4. Nucor Corp.; Vulcraft Group. (design basis on structural plans)
 - 5. Valley Joist.
 - 6. DACS, Inc.
 - 7. Cordeck.
 - 8. Consolidated Systems, Inc.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating. . At all exposed conditions, galvanized deck shall cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer. Verify compatibility with top coat specified by Architect.
 - 2.
 - 3. Deck Profile: As indicated.
 - 4. Profile Depth: As indicated.
 - 5. Design Uncoated-Steel Thickness: As indicated.
 - 6. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 - 7. Span Condition: Triple span or more unless not permitted by geometry.
 - 8. Side Laps: Overlapped.

2.03 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Canam Steel Corporation.
 - 2. Epic Metals Corporation.
 - 3. New Millennium Building Systems, LLC.
 - 4. Nucor Corp.; Vulcraft Group. (design basis on structural plans)
 - 5. Valley Joist.
 - 6. DACS, Inc.
 - 7. Cordeck.
 - 8. Consolidated Systems, Inc.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Profile Depth: As indicated.
 - 3. Design Uncoated-Steel Thickness: As indicated.
 - 4. Span Condition: Triple span or more unless not permitted by geometry.

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2.04 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- K. Galvanizing Repair Paint: ASTM A 780.
- L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work. See structural drawings for 12 gage reinforcement plate required at small openings in the deck.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Deck fasteners shall be in accordance with structural contract drawings.

3.03 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members as indicated on the plans.

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1. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels as indicated on the plans.
- B. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option. (do not butt at open web steel joist).
- C. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 4 inches apart with at least one fastener at each corner.
 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members as indicated on the plans.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels as indicated on the plans.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 1. End Joints: Lapped 2 inches minimum at non-composite deck. Butted at centerline of support at composite deck (1/2" maximum gap).
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
 1. Girder filler shall be provided on both sides of composite girder beams (spanning parallel to composite deck span) to ensure full concrete coverage over top flange of girder beam.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck. Continuous closure pieces shall be cut at deck valleys as deemed necessary by Engineer.
- F. Provide shoring of floor deck if indicated on Drawings.
- G. Weld stud shear connectors through steel deck to structural members below.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
- F. Prior to placement of roofing material over metal roof deck, the Contractor shall notify Testing Agency to perform inspection of roof deck fastening to supporting elements. Roofing material shall not be placed until inspection results are reviewed by Architect and all corrective work is complete.

3.06 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

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- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section.
- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 09 Section.
- D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

Section 05 40 00 Cold-Formed Metal Framing

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Exterior non load-bearing wall framing (Delegated design. See Performance Requirements).
 - 2. Exterior soffit framing (Delegated design)
- B. This specification section applies to all references in the contract documents to specification section 05 41 00 as well as section 05 40 00.
- C. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads shown in plans and for resisting wind pressures determined from the wind speeds, exposure and risk category provided on plans.
 - 1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height for walls supporting brick/masonry veneer. Horizontal deflection of 1/360 of wall height for all other walls. Ultimate wind loads may be multiplied by 0.42 as allowed by IBC for purposes of wall deflection limits.
 - b. The above deflection limits apply at all spans of the framing member, including cantilever spans and overhangs.
 - 2. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 3/4 inch.
 - 4. Design cold-formed framing systems to withstand any design loads and forces acting onto the cold-formed framing systems from any storefront/glass assemblies. Proper consideration of point loads from mullions shall be indicated in the design calculations.
 - 5. Design cold-formed framing systems to accommodate connections of any storefront/glass assemblies.
 - 6. All framing conditions which preclude the complete usage of cold-formed metal framing as indicated on the construction documents shall be identified prior to bidding or be resolved after bidding at no additional cost to the owner. Provide fixed connections to the structure where required for stability at cantilever conditions. Connections to structure shall be designed and provided by cold-formed metal framing supplier. Only provide fixed connections to structure when required for stability. Do not add kicker braces to reduce the span length of exterior wall studs. Do not attach to bottom flange of steel beams unless indicated on structural drawings.
 - 7. Design all exterior soffit ceilings to resist uplift in accordance with ASCE 7. Design soffit framing for dead weight of soffit and for a vertical construction live load of 10 psf minimum and a simultaneous 300 pound point load where erector can stand and otherwise load such framing.
 - 8. Design interior wall framing for a net horizontal differential pressure of 5 psf perpendicular to the wall surface (in either direction) due to differential interior air pressure between rooms and incidental loading.



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9. Thickness of cold-formed metal framing shall be minimum required for anchorage at all louvers, doors, windows, and other wall openings. Coordinate with applicable supplier for minimum thickness of material for anchorage at framed wall openings.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.04

SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work. Layout for metal stud wall framing shall include building elevations and/or wall plans indicating applicable wall sections in shop drawings. Provide wall sections for all unique exterior wall framing conditions around perimeter of building, including applicable locations where sections have not been provided in contract drawings. Contact Architect/Engineer prior to submittal of Shop Drawings if any additional information is required. For exterior canopies supported by cold-formed metal framing, the detailing of canopy connections to the cold-formed metal framing shall be clearly indicated on the shop drawings (general contractor shall coordinate loading and connection compatibility between canopy supplier and cold-formed metal stud supplier).
 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Submit shop drawings, sealed and signed by a qualified Louisiana Registered Civil Engineer.
 - a. Shop drawings shall be computer generated using two-dimensional drafting software (minimum).
 - b. Shop drawings (and all other information necessary for field construction) shall be on completely separate sheets from structural analysis data (calculations).
 3. Allow 21 days for review of cold-formed metal framing shop drawings, excluding delivery time to and from the contractor.
 4. For shop drawings that are marked "Mark Corrections Noted", provide Architect/Engineer with an electronic record set of the shop drawings for informational purposes once all revisions are made.
 5. Do not submit shop drawings prior to review and approval of storefront/glass assembly submittals and pre-engineering metal building submittals.
- C. Welding certificates (if any welding is required).

1.05

QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

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- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 - 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- I. The general contractor is responsible for coordinating with the cold-formed metal framing designer to ensure the metal framing is installed in accordance with the approved shop drawings. The Architect/Engineer is not responsible for verifying proper installation of cold-formed metal framing.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing, not including pre-engineered roof trusses, by one of the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. California Expanded Metal Products Company.
 - 3. Clark/Western Steel Framing.
 - 4. Consolidated Fabricators Corp.; Building Products Division.
 - 5. Custom Stud, Inc.
 - 6. MarinoWare; a division of Ware Industries.
 - 7. Quail Run Building Materials, Inc.
 - 8. SCAFCO Corporation.
 - 9. Southeastern Stud & Components, Inc.
 - 10. Steel Construction Systems.
 - 11. Steeler, Inc.
 - 12. United Metal Products, Inc.

2.02 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60, A60, AZ50, or GF30.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G90.
- C. Screws: All screws used in the manufacture of steel roof trusses shall be exterior rated zinc coated self-drilling screws.

2.03 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
 - 2. Minimum Flange Width: 1-5/8 inches.
 - 3. Section Properties: As required by design. See drawings for required depth of wall.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428.

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2. Minimum Flange Width: 1-1/4 inches.
3. Section Properties: As required by design. See drawings for required depth of wall.
- C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
 2. Flange Width: 1 inch plus the design gap for 1-story structures.
 3. Section Properties: As required by design. See drawings for required depth of wall.
- D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
 - b. Minimum Flange Width: 1 inch plus twice the design gap.
 - c. Section Properties: As required by design. See drawings for required depth of wall.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0428 inch.
 - b. Minimum Flange Width: width equal to the sum of outer deflection track flange width plus 1 inch.
 - c. Section Properties: As required by design. See drawings for required depth of wall.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.04 EXTERIOR SOFFIT FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: As required by design but in no case less than 0.0329 inch.
 2. Minimum Flange Width: 1-5/8 inches.
 3. Minimum section: as required structurally or as specified on plans. See drawings for maximum allowed depth of element.

2.05 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers, knee braces, and girts.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.

2.06 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

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- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

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

2.08 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

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- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.03

INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

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- K. Exterior Soffit Framing: Provide horizontal and vertical members as required for support of all exterior soffit ceilings. Vertical members shall be provided at all structural steel beam and open web steel joist locations to uniformly distribute weight and loading of soffit ceiling to structure above. Vertical members may attach to underside of composite-concrete metal decks where required and the attachments shall be made such that a line load is imposed perpendicular to the deck span direction. Vertical members shall not attach directly to non-composite concrete metal floor decks and metal roof decks. All attachments to open web steel joists shall be made at each panel point location. All kickers shall only be provided between metal stud framing member where required for stability and without interfering with other work or requirements indicated by the drawings. Kicker brace configurations shall not induce torsion or twisting into floor beams or joists and attachments shall be made for direct transfer of horizontal to floor or roof deck, where required for stability.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Maximum Stud Spacing: 16 inches, or as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. At Contractor's option, single or double deflection tracks may be used.
 - 2. Install single deflection track and attach to building structure.
 - 3. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 4. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system. Provide miscellaneous framing and connections as required for support of all masonry veneer, cast stone bands, and other wall covering elements.

3.05 FIELD QUALITY CONTROL

- A. Testing agency will report test results promptly and in writing to Contractor and Architect.
- B. Remove and replace work where test results indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.06 REPAIRS AND PROTECTION

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

END OF SECTION

Section 05 50 00 Metal Fabrications

Specifications

05 50 00-1

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The work required under this section consists of metal fabrications made of steel shapes, sheets, plates, pipes as required for miscellaneous supports and railings.

1.02 WORK INCLUDES

- A. Pipe handrails, bollards, stairs and landings, fixed access ship and roof ladders where indicated in drawings. Provide steel access ladder at elevator pit.
- B. Miscellaneous steel that may be required for brick lintels, pipe supports, etc. where otherwise not specified and/or shown in Structural Sections and Drawings.

1.03 GENERAL CONTRACTOR'S RESPONSIBILITIES

- A. As scope and performance documents, the Contract does not necessarily indicate or describe all the work required for the performance and completion of the Work. General Contractor shall furnish and install the items required for proper completion of the Work without adjustment to price or schedule. Work shall be of sound, quality construction and the General Contractor shall be solely responsible for the inclusions of adequate labor and materials to cover the proper and timely fabrication and installation of the miscellaneous metal items indicated, described or implied.
- B. As a performance specification, the criteria for the solution of structurally sound miscellaneous metal items indicated on the Drawings or specified herein are the sole purposed of defining the design intent and performance requirements. The details shown are intended to emphasize the acceptable profiles and performance requirements for this Project. To avoid any misunderstanding or lack of interpretation, the General Contractor is hereby advised that the responsibility for the miscellaneous metal items are totally his and that designs and resolutions proposed in the General Contractor's shop drawings, structural calculations, and related documentation shall be demonstrated throughout the Work and warranty period specified or required.
- C. Design proposal submissions which follow exactly the details indicated on the Drawings will not relieve the General Contractor of his responsibility for the design, fabrication, erection, or performance of the Work of this Section.
- D. With the approval of the Architect, the Contractor may provide fabricated Steel Stairs under this Section, with the requirement that all design shall comply with the applicable codes concerning structural and life safety codes.

1.04 QUALIFICATIONS OF FABRICATOR

- A. Fabricator shall have a minimum of five (5) years of experience in the design and fabrication of steel stairs and all other items in this Section.

1.05 SUBMITTALS

- A. Provide evidence of fabricator's experience of design and fabrication of steel stairs, including project, year constructed, and General Contractor; provide a minimum of five (5) project references.
- B. Provide detailed drawings, including plans, sections, details of all items in this section; include material sizes, dimensions, and any other relevant information required by the Architect.
- C. Provide evidence of design of stair members, support, and connections by a structural engineer licensed in the State of Louisiana.
- D. Provide calculations for stairs, bearing signature and seal of professional engineer required in this section.

PART 2 PRODUCTS

2.01 MISCELLANEOUS MATERIALS

- A. Ferrous Metals:
 - 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
 - 2. Steel Angles, Plates, Shapes and Bars: ASTM A 36.

Section 05 50 00 Metal Fabrications

Specifications

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3. Steel Pipe: ASTM A 53; Type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (sched. 40), unless otherwise indicated.
 4. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
 5. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
 - B. Stainless Steel:
 1. Bars, shapes, tubing, pipe, plate, sheet, fasteners: SAE type 304.
 2. Welding materials: AWS D1.6; type required for materials being welded.
 3. Satin polished finish: number 4, satin directional polish parallel with long dimension of finished face.
 - C. Grout:
 1. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout recommended by manufacturer for all applications specified herein.
 - D. Fasteners:
 1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
 2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
 3. Lag Bolts: Square head type, FS FF-B-561.
 4. Machine Screws: Cadmium plated steel, FS FF-S-92.
 5. Wood Screws: Flat head carbon steel, FS FF-S-111.
 6. Plain Washers: Round, carbon steel, FS FF-W-92.
 7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type and style as required.
 9. Lock washers: Helical spring type carbon steel, FS FF-W-84.
 - E. Paint:
 1. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.
 2. Galvanizing Repair Paint: High zinc dust content paint for reglazing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.
 - F. Galvanizing: Provide a zinc coating for those items, if indicated or specified to be galvanized, or if located at exterior, as follows:
 1. ASTM A 153 for galvanizing iron and steel hardware.
 2. ASTM A 123 for galvanized rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
 3. ASTM A 386 for galvanizing assembled steel products.
 - G. Shop Painting:
 1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting (red oxide).
- 2.02 PIPE HANDRAILS
- A. Provide sizes and wall thickness indicated in drawings as required to complete work, but not less than that required by code to support the design loading. Welds shall be ground smooth. Support brackets shall be so designed as to meet requirements of IBC and NFPA (most recent editions adapted by Authorities Having Jurisdiction)
- 2.03 FIXED LADDERS
- A. Steel bars and plate construction; design to comply with OSHA standards.
 - B. Provide all anchors and hardware as appropriate for substrate.
 - C. Provide fixed ladders for access: refer to drawings for number and locations.

Section 05 50 00 Metal Fabrications

Specifications

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- 2.04 PIPE BOLLARDS
 - A. Provide 6.6 inch minimum O.D. Schedule 40 hot-dipped galvanized steel pipe guard post or size as detailed on drawings. Fill with 2500 psi concrete after installation and round-off concrete top. Place in concrete footing as detailed on drawings.
 - B. Galvanize pipe after fabrication. Paint in accordance with Division 09.
- 2.05 LOOSE LINTELS AND SHELF ANGLES
 - A. Fabricate from steel shapes as shown on drawings; in event of contradiction of shape and orientation between architectural and structural schedules and drawings, bring to the attention of the Architect during the submittal of the shop drawings for direction and clarification.
 - B. Hot-dip galvanize after fabrication.
- 2.06 STEEL STAIRS AND RAILINGS
 - A. Fabricate from steel as required to achieve configuration as indicated in drawings. Fabricator shall be responsible for the structural design of the stairs, railings, intermediate landings (and their support), attachment details to floor/framing and walls. Fabricator shall be responsible for the sizes of all members of the stair components and assembly.
 - B. Railings shall be so designed and fabricated so as to meet lateral force requirements of all applicable codes.
 - C. All welds and joints shall be ground smooth, free of burrs and ridges.
- 2.07 DOWNSPOUT GUARDS
 - A. Cast iron or cast aluminum. No pvc.

PART 3 EXECUTION

- 3.01 EXAMINATION
 - A. Verify that field conditions are acceptable and are ready to receive Work.
- 3.02 PREPARATION
 - A. Clean and strip primed steel items to bare metal where site welding is required.
 - B. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.
- 3.03 FABRICATION
 - A. Fit and shop assemble items in largest practical sections, for delivery to site.
 - B. Fabricate items with joints tightly fitted and secured.
 - C. Continuously seal joined members by continuous welds.
 - D. Grind exposed joints flush and smooth with adjacent finish surface. Ease exposed edges to small uniform radius.
 - E. Exposed welded joints: NOMMA Guideline 1 Joint Finish 1 – no evidence of a weld.
 - F. Exposed mechanical fastenings: flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where noted otherwise
 - G. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- 3.04 INSTALLATION
 - A. Install items plumb and level, accurately fitted, free from distortion or defects.
 - B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
 - C. Field weld components indicated on shop drawings.
 - D. Perform field welding in accordance with AWS D1.1.
 - E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

Section 05 50 00

Metal Fabrications

Specifications

05 50 00-4

3.05 ERECTION TOLERANCES

- A. Maximum Offset From True Alignment: 1/4 inch.
- B. Maximum Out-of-Position: 1/4 inch.

3.06 SCHEDULE OF ITEMS TO BE PROVIDED

- A. Downspout guards to be provided at all exposed downspouts (18" in length).
- B. Lintels at brick veneer.
- C. Items in this schedule are to be provided and installed regardless if not indicated in drawings, and provide/install any other steel fabrications and items indicated in drawings or as may be required to complete all work indicated and design intent.

END OF SECTION

Section 06 10 00 Rough Carpentry

Specifications

06 10 00-1

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Blocking and bucks in wall openings; wood furring and grounds, concealed wood and PVC blocking.
 - B. Concealed wood and PVC blocking for support where illustrated in drawings, and as required for attachment and support of doors, reinforcing, and trim.
- 1.02 REFERENCES
 - A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.
 - B. ANSI A208.1 - Mat-Formed Wood Particleboard.
 - C. APA (American Plywood Association).
 - D. NFPA (National Forest Products Association).
 - E. SPIB (Southern Pine Inspection Bureau).
- 1.03 QUALITY ASSURANCE
 - A. Perform Work in accordance with the following agencies:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: Certified by APA.

PART 2 - PRODUCTS

- 2.01 LUMBER MATERIALS
 - A. Lumber Grading Rules: WHPA.
 - B. Non-Structural Light Framing: 1x, 2x, and 4x Southern Pine species, 19 percent maximum moisture content pressure preservative treat.
 - C. Plate, Nailers: Pressure treated Southern Pine.
 - D. Plywood: APA rated appropriate for use; thicknesses as required to achieve detail requirements or as specifically indicated in drawings.
- 2.02 FACTORY WOOD TREATMENT
 - A. Wood Preservative Pressure Treatment: AWWPA Treatment C1 using water borne preservative with 0.25 percent retainage.
 - B. Wood Preservative Surface Application: Clear type.
 - C. Composite wood and agrifiber products are to contain no added urea-formaldehyde resins.

PART 3 - EXECUTION

- 3.01 SCHEDULES
 - A. Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

END OF SECTION

Section 06 16 00

Sheathing

Specifications

06 16 00-1

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Parapet sheathing.
 - 4. Underlayment.
 - 5. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.
 - 2. Section 07 27 26 "Fluid Applied Membrane Air Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Factory mark panels to indicate compliance with applicable standard.

2.3 WALL SHEATHING

- A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
 - 1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. CertainTeed Corporation; GlasRoc.
 - b. Georgia-Pacific Building Products; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - d. Temple-Inland Building Products by Georgia-Pacific; GreenGlass Exterior Sheathing.
 - e. United States Gypsum Co.; Securock.
 - 2. Type and Thickness: Type X, 5/8 inch thick.
 - 3. Size: 48 by 96 inches for vertical installation.

2.4 ROOF SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing.
 - 1. Nominal Thickness: Not less than 1/2 inch.

Section 06 16 00

Sheathing

Specifications

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2.5 PARAPET SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. CertainTeed Corporation; GlasRoc.
 - b. Georgia-Pacific Building Products; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - d. Temple-Inland Building Products by Georgia-Pacific; GreenGlass Exterior Sheathing.
 - e. United States Gypsum Co.; Securock.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For [roof] [parapet] [and] [wall] sheathing, provide fasteners [with hot-dip zinc coating complying with ASTM A 153/A 153M] [of Type 304 stainless steel].
2. For [roof] [parapet] [and] [wall] sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inchthick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inchthick, use screws that comply with ASTM C 954.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 incheswide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

Section 06 16 00

Sheathing

Specifications

06 16 00-3

- E. Coordinate wall and sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.3 PARTICLEBOARD UNDERLAYMENT INSTALLATION

- A. Comply with CPA's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
 - 1. Fastening Method: Glue and nail underlayment to subflooring.

END OF SECTION

Section 06 25 30

Slatwall Retail Panels

Specifications

06 25 30 -1

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: T-Grooved wood composite 3/4" (19mm) thick panels, pre-engineered and machined for use with [groove inserts and] retail display hardware..
 - 1. Attachment System:
 - a. Direct fastening of slatwall to [metal stud][wood stud] [or] [furring] framing.
 - 2. Panels:
 - a. Faux Print finish (Simulated Wood Grain) applied by offset gravure print process utilizing solid color oven-baked base paints, ink overprints and oven-baked protective topcoat.
 - b. Azure (Wood Grain) and Graphic Images applied using direct digital imaging to wood fiber substrate including seal coats, color inks and protective topcoats.
 - c. Wood veneer laminated to wood fiber substrate having a balancing backer sheet, with protective topcoats.
 - d. High Pressure Laminate adhered to wood fiber substrate and having a balancing backer sheet.
- B. Products Not Furnished or Installed under This Section:
 - 1. Display fixtures, hooks or brackets arms.
 - 2. Wood Veneer casework.
 - 3. Gypsum board backup.

1.2 RELATED SECTIONS

- A. Section [] - Wood [Metal] Stud Framing
- B. Section [] - Custom Cabinets
- C. Section [] - Solid Wood Paneling
- D. Section [] - Gypsum Wallboard.
- E. Section [] - Painting & Transparent Finishes.
- F. Section [] - Resilient Base.

1.3 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
 - 1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Architectural Woodwork Standards as published by the Architectural Woodwork Institute, the Architectural Woodwork Manufacturers Association of Canada, and the Woodwork Institute.
 - 1. Architectural Woodwork Standards - Edition 1.

Section 06 25 30

Slatwall Retail Panels

Specifications

06 25 30 -2

1.4 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color and pattern selection samples representing manufacturer's full range of available colors and patterns.
 - 1. Provide samples of edge trim as applicable.
 - 2. Provide samples for groove insert selection as applicable.
- D. Samples for Verification: Submit sample for each component and for each exposed finish required, prepared on samples of size indicated below complete with exposed molding and trim samples. Sample to indicate type, finish, and color specified.
 - 1. Laminate and printed finishes: Submit 6" (154mm) by 10" (254mm) section of panel for each panel selected indicating the color, texture, and pattern required.
 - a. Submit complete with specified applied finish.
 - b. For selected patterns show complete pattern repeat.
 - 2. Painted finishes: Submit 6" (154mm) by 10" (254mm) samples of each type and color.
 - 3. Wood Veneers: Submit sample sets of [each] wood veneer with stain color and finish required. Sample size approximately 6" (154mm) by 10" (254mm). Sample sets to show the full range of normal color and texture variations expected.
 - 4. Mirrored Acrylic: Submit 6" (154mm) by 10" (254mm) sample.
- E. Manufacturers Material Safety Data Sheets (MSDS) for panels, adhesives prior to their delivery to the site.
- F. Maintenance Instructions.

1.5 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - 2. Required Rating – Class [A.] [C.]

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels and associated materials factory packaged on strong pallets and properly packaged or protected.
 - 1. Upon delivery carefully inspect all cartons, packages, pallets and protective wrap for damage or material shortage.
 - 2. Open and inspect suspect packages, cartons or wrapped pallets for damage.
 - 3. Contact shipper immediately to report any damaged or missing materials.
 - 4. Contact Marlite @ (800) 377-1221 immediately to report any damaged or missing materials.
 - 5. Contact Marlite @ (800) 377-1221 with any questions, problems or concerns.
- B. Store products in manufacturer's unopened packaging until ready for installation.
 - 1. Maintain plastic or other protective wrap in place during on site handling until ready for installation.

Section 06 25 30

Slatwall Retail Panels

Specifications

06 25 30 -3

2. Keep panels clean and do not stack panels after removal of protection.

- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Wood composite panels are subject to the effects of humidity and temperature. Do not use in kitchens, rest rooms, or other high humidity areas.
- B. Partition walls are to be finished and the building completely closed. Walls shall be thoroughly dry and concrete cured and dry before starting installation.
- C. HVAC system must be operable and installation area must be balanced to normal operating conditions.
- D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. To ensure product performance, a temperature range of 60°-80°F (16°C-27°C) and a humidity range of 35-55% must be maintained during storage, installation and product life cycle. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION AND SEQUENCING

- A. Except as specified by the architect, it's recommended to locate trim members so that panel lines coordinate with doors, headers, jambs and other discontinuities in a wall.
- B. Vapor barrier shall be used on exterior walls behind backing to discourage warping.
- C. Coordinate with casework manufacturer. Deliver material to the fabrication shop.

1.9 WARRANTY

- A. Standard Warranty: All products shall be warranted to be free from defects for a period of 30 days after installation.

PART 2 - PRODUCTS

- 2.1 Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- A. Marlite – Slatwall Panel (Basis of Design)
- B. American Retail Supply – Slatwall Panel

2.2 PANEL

- A. Panel Configuration: Engineered groove machined into wood composite substrate.
 1. Panel thickness – 3/4" (19mm) thick with nominal 1/2" (13mm) deep slotted groove.

Section 06 25 30

Slatwall Retail Panels

Specifications

06 25 30 -4

2. Panel face dimensions: 48" (1.22m) by 96" (2.44m) [As indicated on the drawings].
 - a. Dimensions: Nominal 24" (600mm) high x [24" (600mm)] [48" (1.22m)] [72" (1.8m)] [as indicated on the drawings].
 3. Slatwall panels grooves machined on [3" (76mm)][6" (15mm)][12" (30mm)] centers [as indicated on the drawings].
- B. High internal bond wood composite substrate. Slatwall panels shall have formaldehyde emissions of 0.3 PPM or less and shall comply with HUD 24 CFR Part 3280 Standards set fourth for particleboard panels.

1. Standard Slatwall
 - a. Medium density wood fiberboard conforming to ANSI A208.2, industrial-grade MDF or other wood fiber substrates having not less than 75% recycled wood waste.
2. Slatwall EQ
 - a. High pine particleboard, industrial grade. NAF (No-Added Formaldehyde). 100% post-industrial recycled/recovered content. CARB exempt. Physical properties tested using method ASTM D1037-06
3. Standard Slatwall, NAF
 - a. Medium density wood fiberboard conforming to ANSI A208.2, industrial-grade MDF and having No-Added Formaldehyde (NAF).

2.3 PANEL FINISH

- A. Marlite's Printed Finish: Modified melamine enamel (base coat, precision coats, print coats and melamine top coat) baked to achieve outstanding performance characteristics.
1. Color: [Sierra Maple Marlite #310][Alum Rock Maple Marlite #317][Windsor Anigre Marlite #318][Whittier Anigre Marlite #319][Champagne Maple Marlite #342][As selected by Architect from manufacturer's standard selection.]
- B. Low Pressure Laminate (Melamine treated paper) bonded to wood fiber substrate by hot melt adhesive.
1. Finish: [Hard Maple Marlite #687] [Fine Oak Marlite #692][Linn Birch Marlite #711] [Brushed Aluminum Marlite #738] [Tornado Gray Marlite #742][Swiss Almond Marlite #744] [Goshen White Marlite #750] [Stone Gray Marlite #751] [Trojan Black Marlite #844][Cherry Marlite #975] [As selected by Architect from manufacturer's standard selection.]
- C. High Pressure Laminate: Vertical grade 0 .030" (0.762mm) thick high pressure plastic laminate adhered to wood fiber substrate by cold pressing polyvinyl acetate (PVA) type II, water resistant adhesives.
1. Edges - Square, and sealed, to provide a black edge.
 2. Balancing Backer: Kraft Paper that does not contribute to or pose an unusual additional fire hazard.
 3. Color and Pattern: _____ [As selected by Architect from manufacturer's standard selection.]
- D. Wood Veneer Panels: Wood veneer applied to the substrate via cold press to wood fiber substrate, and coated with furniture grade catalyzed finish.
1. Edges: Square cut and sealed.
 2. Balancing Backer: Wood veneer measuring between 0.015" (0.38mm) and 0.025" (0.64mm).
 3. Veneer Face: Architectural grade rotary cut veneer. 0.035" (0.89mm) thick [Red Oak Veneer Marlite #020][White Birch Veneer Marlite #041][As selected by Architect from manufacturer's standard selection.]
 4. Species and Cut: _____ [As selected by Architect.]
Grain direction shall be manufacturer's standard. [As selected by Architect.]
- E. Mirrored Acrylic: a .080" (2.032mm) thick acrylic sheet backed with reflective film, cold press laminated to the substrate.

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Slatwall Retail Panels

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1. Marlite #601 Clear Mirrored Acrylic.

F. Painted Finishes:

1. Standard Factory Finish: [Frost White Marlite #415][Almond Marlite #515][Brite White Marlite #703][Crystal Gray Marlite #764][As selected by Architect from manufacturer's standard selection.]
2. Paint Grade: Smooth unfinished surface suitable for field or in-shop finishing.
3. Primed Finish: Alkyd primer factory applied and baked creating a suitable surface for field finish in one coat.

2.4 GROOVE TREATMENT AND TRIMGroove Treatment:

1. Marlite 1000 Series.
2. Marlite 2000 Series.

Painted groove.

- a. PVC solid color trim strips; color [white] [black].
- c. Vinyl ColorSnaps; color [white][red][platinum][black][ivory]
- d. HPL trim strips: color select from HPL manufacturer's color options. Installed in
- e. Aluminum Insert: Available in Mill finish. Installed in field by others.
3. 2101 Series: for flat metal back accessories only
4. 3000 Series: Factory installed L groove insert
5. Marlite 5000 Series: Factory installed vinyl inserts [white][black]
6. Marlite 7000 Series: Factory installed aluminum insert – [mill finished][black].

B. Panel Trim:

1. Outside/Inside Corner – [Marlite A760 1" x 1" x 8'-0" (2.4m) aluminum mill finish] [Marlite P760 1-3/8" x 1-3/8" x 8'-0" (2.4m) aluminum [white] [Gray] finish]
2. Edge – [Marlite A770 1/2" x 3/4" x 8'-0" (2.4m) aluminum mill finish] [Narrow profile; Marlite M770 5/16" x 3/4" x 10'-0" (3m) lengths aluminum satin finish] [Wood Profile Marlite W770 9/16" x 1" x 8'-0" Poplar, for field finishing.]

2.5 INSTALLATION ACCESSORIES

A. Phillips, bugle head, coarse threaded screws.

B. Marlite Rail Assembly: Combination of Mounting Track and Panel Bar

1. Steel prefinished at the factory. Silver Powder Coat
2. P770 Edge – [D100White][D109 Gray]

C. Adhesives:

1. Marlite Brand SS5262 Heavy Duty C-109 solvent based adhesive unless otherwise approved by Marlite.

2.6 FABRICATION

A. All framing, panels, hardware and accessories shall be factory finished and ready to install except for field fabrication required by perimeter and corner conditions.

B. Refinish field cut panel edges in accordance with manufacturer's instruction before installation.

C. Fabrication Tolerances for panels:

1. Dimensional: $\pm 0.0625"$
2. Square: $\pm 0.125"$ across diagonals
3. Thickness: $\pm 0.008"$
4. Grooving: $\pm 0.031"$ (groove width and spacing between grooves)

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Slatwall Retail Panels

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed. Submit written notification to Architect and system manufacturer if such conditions are unacceptable. Beginning erection constitutes installer's acceptance of conditions.
 - 1. Verify that a vapor barrier has been provided on exterior walls behind backing to prevent warping.
 - 2. Verify backing panels are smooth, solid, and flat. All drywall joints are to be taped and finished.
 - 3. Verify that walls are primed before installation begins.
 - 4. Verify mechanical, electrical, and building service and/or items affecting work of this section are placed and ready to receive this work.
 - 5. Verify that stud spacing does not exceed 24" (600mm) on-center.
- B. Structural walls are to be finished, with building completely closed. Walls shall be thoroughly dry before starting installation.

3.2 PREPARATION

- A. Conditioning: Panels must be allowed to acclimate to a balanced environment in the installation location for 72 hours prior to installation.
- B. Protect existing surfaces with drop cloths.
- C. Except as directed by the architectural drawings, before installing, examine panels and arrange to achieve best combination of color, pattern, texture and grain.

3.3 INSTALLATION

- A. Install all materials in strict accordance with the manufacturer's installation instructions with hardware straight, plumb, and level.
 - 1. Anchor units rigidly and securely in place.
 - 2. Cut sheets to meet existing supports.
- B. Fasten initial bottom panel to the wall with #6 or #7 bugle head drywall screws. Install a minimum of one screw every third slot (or 9" (228mm)) vertically and every stud horizontally, typically every 16" (40.64cm) on centers horizontally (maximum 24" (600mm) on centers horizontally). Each 4' x 8' panel shall have minimum of 42 screws secured to studs or furring.
 - 1. Where screws do not hit the studs, fasten with adhesive in accordance with the manufacturer's recommendations.
 - 2. Screws must be installed thru the panel grooves.
 - 3. Slatwall panels without inserts do not require pre-drilling.
 - 4. Slatwall panels with inserts require 5/32" pre-drilling of holes thru the insert and panel before fastening.
- C. Avoid contamination of the panel faces with adhesives, solvents or cleaners during installation.

3.4 CLEANING AND PROTECTION

- A. Clean and remove dust and other foreign matter from panel and framing surfaces. Clean finishes in accordance with manufacturer's instructions.

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Slatwall Retail Panels

Specifications

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END OF SECTION

PART 1 GENERAL

1.01 SUMMARY: Section Includes:

- A. Specially fabricated custom casework, wood or high pressure decorative laminate finish
- B. Specially fabricated custom countertops, solid surfacing fabrications and high pressure decorative laminate finish
- C. Hardware typically furnished by the woodwork manufacturer:
 - 1. Cabinet door hinges
 - 2. Cabinet door and drawer pulls, when specified in this section
 - 3. Drawer glides
 - 4. Cabinet door and drawer locks, when specified in this section
 - 5. Adjustable shelf standards and/or support brackets or clips
 - 6. Grommets
- D. Specially fabricated custom wood paneling and related trim.
- E. Factory finishing or pre-finishing of all transparent finish millwork
- F. Installation of work furnished under this section

1.02 RELATED SECTIONS

- A. Rough carpentry, wood blocking, and grounds within finished walls and above finished ceiling
- B. Finish carpentry, wood trim other than specified in this section
- C. Mechanical section(s)

1.03 REFERENCES

- A. Architectural Woodwork Institute AWI Quality Standards, current edition
- B. ANSI/BHMA A156.9 - Cabinet hardware
- C. ANSI A135.4 – Basic Hardboard.
- D. NEMA LD3 – High pressure decorative laminate
- E. ANSI/HPVA HP-1 – Decorative plywood and paneling

1.04 SUBMITTALS

- A. Product Data: For Plywood, solid-surfacing fabrications, high-pressure decorative laminate, adhesive for bonding plastic laminate, cabinet hardware and accessories, and finishing materials and processes.
- B. Shop drawings: Show locations of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
 - 1. Submit according to Section 01 33 00. Include statement on front page indicating that Fabrication, Finishing and Installation will be performed in compliance under the specified AWI Quality Standard.
 - 2. Indicate plans and elevations, materials, surface grain directions, profiles, assembly methods, joint details, fastening methods, accessories, hardware, compliance with specified fire retardant treatments and schedule of finishes
 - 3. Show locations and sizes of furring, blocking and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- C. Finish samples: Submit two or more sets of three samples illustrating expected range of finish color and grain for each species.
 - 1. Lumber with transparent finish, 5 inches wide by 17 inches long, for each species and cut, finished on 1 face and 2 edges.
 - 2. Wood veneer-faced panel products with or for transparent finish, 10 by 16 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.
 - 3. Plastic-laminate clad panel products: 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of un-faced panel product used for core.
 - 4. Solid-surfacing fabrications: 8 by 10 inches, for each type, color, pattern, and surface finish, including control sample of field-installed seaming.
 - 5. Corner pieces as follows: Miter joints for standing trim.
 - 6. Exposed cabinet hardware and accessories, one unit for each type and finish.

Section 06 40 00 Architectural Woodwork

Specifications

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- 1.05 QUALITY ASSURANCE
 - A. Perform work in accordance with AWI Premium Grade quality.
 - B. Work in this Section shall comply with the specified Grades of the current edition of the Architectural Woodwork Institute Quality Standards.
 - C. Woodwork manufacturers and installers shall be certified by the AWI Quality Certification Program as competent to perform the work specified.
 - D. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified.
- 1.06 DELIVERY, STORAGE AND HANDLING
 - A. Deliver, store, and handle products to site under provisions of Section 01 60 00.
 - B. Protect units from moisture damage according to AWI Quality Standards, Section 1700, Installation
 - C. Millwork shall not be delivered to jobsite before building is fully enclosed and conditioned. If contractor elects to have millwork delivered to jobsite prior to building is conditioned, the contractor shall be responsible for any damage. Contractor acknowledges that this violates the requirements for AWI Premium Grade millwork, and assumes liability for this violation.
- 1.07 FIELD MEASUREMENTS
 - Verify that field measurements are as indicated on shop drawings.
- 1.08 COORDINATION: Coordinate work with applicable mechanical trades and rough-in
- 1.09 WARRANTY: Provide manufacturer's one (1) year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials.
- 1.10 CLOSEOUT
 - A. Comply with Section 01 70 00 for Closeout Procedures.
 - B. Submit list of approved cleaning materials and procedures, and a list of substances harmful to the component materials. Include instructions for stain removal, surface and gloss restoration.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS
 - Acceptable manufacturers shall be certified by the AWI Quality Certification Program to perform work in this Section of the AWI Grade of Work specified
- 2.02 WOOD MATERIALS
 - A. Softwood Lumber: Graded in accordance with AWI for Grade of Work Specified mill-option species, moisture content of 6-8 percent
 - B. Hardwood Lumber: Graded in accordance with AWI for Grade of Work specified; quarter-sawn Maple, moisture content of 8-10 percent; of quality suitable for transparent finish
- 2.03 SHEET MATERIALS
 - A. Hardwood Plywood 1: Graded in accordance with AWI for Grade of Work specified; plywood only (no particleboard or MDF allowed), type of glue recommended for application; quarter-sawn Maple, clear finish to match sample in Architect's office. Bookmatched between adjacent veneer leaves, panel endmatched, and center balanced matched. ****NOTE: Matching requirements will be strictly reviewed and adhered to.****
 - 1. Door and Drawer fronts: finish as indicated in the Drawings
 - 2. Drawer construction: min. 5/8" thick black melamine with fully housed 1/4" black melamine bottom
 - B. Hardwood Plywood 2: Graded in accordance with AWI for Grade of Work specified; plywood only (no particleboard or MDF allowed), type of glue recommended for application; high pressure decorative laminate, in color and finish as indicated on Drawings.
 - 1. Door and Drawer fronts: finish as indicated in the Drawings

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2. Drawer construction: min. 5/8" thick black melamine with fully housed 1/4" black melamine bottom
 - C. Exterior grade plywood at sink areas.
- 2.04 MANUFACTURERS – HIGH PRESSURE DECORATIVE LAMINATE
Subject to compliance with requirements, provide products by one of the following:
- A. Plastic Laminate: Wilson Art, Formica, or Nevamar; colors and textures per the Drawings
 - B. Metal Laminate: WilsonArt, Formica, or Nevamar; material and textures per the Drawings
 - C. Colors to be selected from Manufacturer's full color range, including metal laminates.
- 2.05 LAMINATE MATERIALS
- A. In addition to the plastic laminate quality levels indicated in the paragraphs below, AWI also includes the following sheet types:
 1. HGS – General Purpose .048" Horizontal faces
 2. VGL – General Purpose .020" Vertical faces
 3. CLS – Cabinet liner .020"
 4. BKL – Unfinished Backing Sheet .020"
 - B. Thermoset decorative overlay: White Melamine, no pattern, and matte surface texture as selected by Architect on plywood. For interiors of cabinets with fully closing doors. Open cabinet interiors to be covered with wood veneer of the same species and finish as that specified on door and drawer faces of adjacent cabinets.
 - C. Plastic laminate backings are to be used on the reverse surface of plastic laminated components, to assist in maintaining dimensional stability by reducing moisture intrusion and subsequent warping of the core material.
- 2.06 ACCESSORIES
- A. Fasteners: Size and type to suite application
 - B. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; all connections shall be concealed
 - C. Concealed Joint Fasteners: Threaded steel
 - D. Grommets: Plastic
- 2.07 HARDWARE
- A. Hinges: Blum 125°
 - B. Pulls: 1/4" diameter brushed stainless steel
 - C. Drawer Slides: Fulturer FR 5000
 - D. Shelf Clips: Plastic White
 - E. Locks: BHMA A156.11, chrome finish
- **PROVIDE LOCKS AT ALL DOORS AND DRAWERS IN THIS PROJECT, KEYED ALIKE PER ROOM****
- 2.08 FACTORY FINISHING MATERIALS
AWI system TR4 conversion varnish with premium grade finish for open grain, medium rub effect, unfilled, 30% sheen, stained.
- 2.09 FABRICATION
- A. Fabricate to AWI Premium Standards
 - B. Door and Drawer Fronts: 3/4" thick; flush overlay.
 - C. Shop-assemble casework for delivery to site in units easily handled and to permit passage through building openings
 - D. Fit shelves, doors, and exposed edges with matching veneer, matching hardwood edging. Use one piece for full length only.
 - E. Cap exposed plastic laminate finish edges with material of same finish and pattern
 - F. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
 - G. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum two feet from sink cut-outs.

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Specifications

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- H. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces as required by AWI Quality Standard.
- I. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from onsite dimensions. Seal contact surfaces of cut edges.

2.10 FINISHING

- A. Sand work smooth and set exposed nails and screws as allowed by specified fabrication methods of AWI Quality Standard.
- B. Apply wood filler in exposed nail and screw indentations. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and that is recommended for applied finishes.
- C. Finish work in the factory in accordance with AWI Quality Standards – Section 1500 Systems
- D. Finish work with transparent finish systems as listed for each item
- E. Finish work to meet AWI premium Quality Standards. Contractor to furnish AWI Certification.

2.11 WOOD TREATMENT

All materials and assemblies specified in this section shall conform with NFPA 255, Class C for interior finishes in accordance with their flame spread and smoke development.

2.12 FABRICATION OF WOOD PANELING

- A. Fabricate to AWI Premium Quality Standards. Contractor to furnish AWI Certification.
- B. Shop prepare and identify sheets for grain matching during site erection
- C. When necessary to cut and fit on site, provide materials with ample allowance for cutting, and provide trim for scribing and site cutting.
- D. Paneling and components to be blueprint matched. Panels to be manufactured to exact sizes required for the project, matched by area and numbered with doors and other components veneered in sequence. All faces to be AA.

2.13 SOLID SURFACE FABRICATIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis of design as indicated in the Drawings.
 - 2. Other Approved Equals, as submitted per Section 01 25 00. Substitutions will only be considered during bidding, and will require a physical sample delivered to architect for review.
- B. Solid polymer components
 - 1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 - 2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
- C. Thickness: 3 cm, unless noted otherwise.
- D. Edge Treatment: As indicated on the Drawings; Adhesively joined to create thickness indicated, with inconspicuous seams.
- E. Backsplash: Applied.
- F. Accessories:
 - 1. Joint adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
 - 2. Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.
- G. Factory Fabrication:
 - 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 without conspicuous joints. Reinforce with strip of solid polymer material, 2" wide.
 - 3. Provide factory cutouts for grommets, plumbing fittings and bath accessories as indicated on the drawings.

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Architectural Woodwork
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- H. Color/Finish: as indicated on the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 MILLWORK INSTALLATION

Install work in accordance with AWI Premium Quality Standard.

- A. Set and secure materials and components in place, plumb and level
- B. Scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps
- C. Install hardware furnished under this section in accordance with manufacturer's instructions
- D. Use fixture attachments in concealed locations for wall mounted components
- E. Use concealed joint fasteners to align and secure adjoining cabinet units, and counter tops
- F. Secure cabinet and counter bases to floor using appropriate concealed angles and anchorages
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces

3.03 SOLID SURFACING INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
 - 1. Provide product in the largest pieces available.
 - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. **Exposed joints/seams will not be allowed.**
 - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 - 4. Cut and finish component edges with clean, sharp returns.
 - 5. Rout radii and contours to template.
 - 6. Anchor securely to base cabinets or other supports.
 - 7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 - 8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 - 9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Repair or replace damaged work which cannot be repaired to architect's satisfaction.
- C. Cleaning and Protection
 - 1. Keep components clean during installation.
 - 2. Remove adhesives, sealants and other stains.

3.04 CLEANING AND PROTECTION

- A. Adjust and Clean: Repair damaged or defective work as directed. Adjust and lubricate hardware for proper operation. Clean exposed interior and exterior surfaces. Clean casework, counters, shelves, hardware, fittings, and fixtures. Remove all glue and tape.
- B. Protection: Installer of architectural woodwork shall advise Contractor of procedures required to protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance. Contractor is responsible for protection after installation.

END OF SECTION

Section 07 17 00 Water Repellants

Specifications

07 17 00-1

PART 1 GENERAL

- 1.01 SECTION INCLUDES
 - A. Water repellent coating applied to exterior new and existing brick veneer and cast stone surfaces.
- 1.02 RELATED SECTIONS
 - A. Section 07 90 00 - Joint Sealers.
- 1.03 REFERENCES
 - A. FS SS-W-110C - Water Repellent, Colorless Silicone, Resin Base.
- 1.04 SYSTEM DESCRIPTION
 - A. Coating to exhibit ability to permit 4 percent maximum moisture absorption in material being treated.
- 1.05 SUBMITTALS
 - A. Submit under provisions of Section 01 33 23.
 - B. Product Data: Provide details of product description, tests performed, limitations to coating, cautionary procedures required during application, and chemical properties including percentage of solids.
 - C. Manufacturer's Installation Instructions: Indicate special procedures and conditions required.
 - D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
- 1.06 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years' experience.
 - B. Applicator: Company qualified performing the work of this section with minimum three years' experience.
- 1.07 MOCKUP
 - A. Provide mockup of surface to be coated under provisions of Section 01 40 00.
 - B. Prepare coated surface on one full standard panel.
 - C. Mockup may remain as part of the Work.
- 1.08 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
 - B. Protect coating liquid from freezing.
- 1.09 ENVIRONMENTAL REQUIREMENTS
 - A. Do not apply coating when surface temperature is lower than 50 degrees or higher than 100 degrees F.
- 1.10 WARRANTY
 - A. Manufacturer shall provide a ten-year warranty for the performance of the product.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS/PRODUCTS
 - A. Prosoco: H40 at restoration areas; Siloxane PD at new construction assembly areas
 - B. Noxcrete: Stifel 100 at restoration areas.
 - C. Applied Technologies: (only at new construction assembly areas) A-Tech Concrete Sealer at new cast stone, A-Tech Masonry and Brick Sealer at new brick masonry
 - D. Substitutions: Under provisions of Section 01 25 13.

PART 3 EXECUTION

- 3.01 EXAMINATION
 - A. Verify joint sealants are installed and cured.

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Water Repellants

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- B. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.
- 3.02 PREPARATION
 - A. Delay work until concrete substrate is cured a minimum of 60 days.
 - B. Remove loose particles and foreign matter.
 - C. Remove oil or foreign substance with a chemical solvent which will not affect coating.
 - D. Scrub and rinse surfaces with water and let dry.
- 3.03 APPLICATION
 - A. Apply coating in accordance with manufacturer's instructions.
 - B. Apply at a rate of sq. ft./gallon as per manufacturer's instructions, by brush.
 - C. Apply in two continuous, uniform coats.
 - D. To be applied at all brick wall surfaces and stone surfaces of building within project scope.
- 3.04 PROTECTION TO FINISHED AND ADJACENT WORK
 - A. Protect adjacent surfaces not scheduled to receive coating.
 - B. Protect property.
 - C. If applied to unscheduled surfaces, remove immediately by a method instructed by coating manufacturer.

END OF SECTION

Section 07 21 00 Building Insulation

Specifications

07 21 00-1

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Board insulation and integral vapor retarder at cavity wall construction.
- B. Foil faced batt thermal insulation at interstitial space between studs, trusses, crevices and penetrations; unfaced thermal and sound attenuation batts above suspended ceiling tile – installed as required to maintain thermal insulating integrity of new and existing building and provide sound attenuation between classroom spaces.
- C. Vapor Barrier at crevices, corners, intersections, where the insulation board is not applied, as required to provide continuous vapor barrier envelope around building.
- D. Mineral fiber insulation at perimeter gap at CMU and roof deck.
- E. Spray foam insulation where indicated in drawings.

1.02 SYSTEM DESCRIPTION

- A. Extent of insulation work is shown on drawings and indicated by this section.

1.03 REFERENCES

- A. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.
- B. ASTM C665 - Mineral Fiber Batt Blanket Insulation

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation adhesives in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Batt Insulation: ASTM C665, preformed glass fiber batt, friction fit, manufactured by Owen Corning, conforming to the following:
 - 1. Thermal Resistance: R19 at 10 inch batts.
 - 2. Facing: Unfaced.
 - 3. Thicknesses; verify, as indicated in drawings; 6" at sound attenuation batts.
 - 4. Manufacturers:
 - a. Celotex
 - b. Owens Corning
 - c. Knauf
 - d. Substitutions: Section 01 63 00
- B. Board Insulation: ASTM C578, extruded polystyrene board, conforming to the following:
 - 1. Facing: Water resistant integral film, one side.
 - 2. Size: 16" wide, 96" length, 2" thick.
 - 3. Compressive Strength: 15 psi minimum.
 - 4. Edges: Square
 - 5. Products/Manufacturers:
 - a. Amifoam SB by Tenneco
 - b. Cavitymate by Dow.
 - c. Foamglas by Owens Corning
 - d. Substitutions: Section 01 63 00
- C. Mineral Fiber Insulation: ASTM C553 and E 96, conforming to the following:
 - 1. Absorption: less than 1% by weight and volume
 - 2. Thicknesses: minimum of 4" before compressed into cavities.
 - 3. Manufacturers:
 - a. Thermafiber LLC: FireSpan
 - b. Owens Corning: Safing Insulation/MW
 - c. Substitutions: Section 01 63 00
- D. Polyurethane Spray Foam Insulation
 - 1. Thermal Resistance: ASTM C518: R3.6 (R13 @ 4-inch, R20 @ 6-inch).
 - 2. Light density, open celled, flexible, 100% water-blown polyurethane foam insulation.
 - 3. Manufacturers:
 - a. Icynene Inc.: Classic Plus
 - b. CertainTeed: Certa Spray
 - c. BASF: Enertite
 - d. Substitutions: Section 01 63 00

Section 07 21 00 Building Insulation

Specifications

07 21 00-2

- 2.02 ADHESIVES
 - A. Adhesive: Type recommended by insulation manufacturer for application.
- 2.03 ACCESSORIES
 - A. Tape: Mesh reinforced; compatible with insulation board.
- 2.04 VAPOR BARRIER
 - A. Vapor Barrier: ASTM E96, reinforced 3 ply polyethylene vapor barrier; Type-65.
 - B. Tape: Asphalt mastic tape used at overlaps of vapor barrier sheets.
 - C. Patch Tape: Self-adhesive tape used to repair any holes in the vapor barrier that are caused during installation and adjacent construction.
 - D. Tape and patch tape shall be made by same manufacturer of vapor barrier.
 - E. Board Joint Tape: As recommended by board insulation manufacturer.

PART 3 - EXECUTION

- 3.01 EXAMINATION AND PREPARATION
 - A. Verify that substrate, adjacent materials are dry and ready to receive insulation and adhesive.
 - B. Verify that vapor barrier and adjacent surfaces to be adhered are clean and dry.
- 3.02 INSTALLATION - BATT INSULATION
 - A. Install insulation and vapor retarder in accordance with insulation manufacturer's instructions.
 - B. Install in exterior walls, roof and ceiling spaces and at gaps or voids.
 - C. Fit insulation tight in spaces. Leave no gaps or voids.
 - D. Where insulation is required on ceilings, provide and install on associated HVAC and electrical items (diffusers/necks, light fixture backs, etc); leave no crevasses, fitting tightly on the items so as to provide a continuous, uninterrupted layer of insulation on ceiling and all associated and integral items.
- 3.03 INSTALLATION - VAPOR BARRIER
 - A. Install vapor barrier in accordance with insulation manufacturer's instructions.
 - B. Install without gaps or voids.
 - C. Secure sheet barrier to surfaces with tape. Lap edges and ends 6 inches and adhesive seal to ensure complete and continuously seal. Patch all holes with patch tape
 - D. Lap all window and door frame perimeters with barrier at wall with 3 inches of contact over frame bearing to frames with 1 inch of contact and seal.
 - E. Vapor barrier shall be installed at perimeter gap at wall and roof deck; lap vapor barrier at perimeter of corrugated steel roof deck, down face/edge of deck at building perimeter so as to prevent outside air from seeping into interstitial space.
- 3.04 INSTALLATION - BOARD INSULATION (only where indicated in drawings)
 - A. Apply adhesive in three continuous beads per board length to 1/8 inch thick on CMU.
 - B. Daub adhesive tight to protrusions to ensure continuity of vapor retarder and air seal.
 - C. Install boards horizontally between wall reinforcement.
 - D. Place membrane surface facing out; tape seal board joints.
 - E. Stagger end joints; butt edges and ends tight to adjacent boards.
 - F. Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
- 3.0 INSTALLATION – SPRAY FOAM INSULATION (only where indicated in drawings)
 - A. Prepare surfaces only as recommended by foam manufacturer.
 - B. Protect surfaces that are not to receive foam.
 - C. Prepare and install spray foam in accordance with manufacturer's requirements.

END OF SECTION

Section 07 26 00 Under-Slab Vapor Barrier

Specifications

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PART 1 – GENERAL

- 1.01 SUMMARY
 - A. Products Supplied Under This Section
 - 1. Vapor barrier, seam tape, mastic, and pipe boots for installation under concrete slabs.
 - B. RELATED SECTIONS
 - 1. Section 03 30 00 Cast-in-place Concrete
- 1.02 REFERENCES
 - A. American Society for Testing and Materials (ASTM)
 - 1. ASTM E 1745-17 (2017) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
 - 2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
 - 4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
 - 5. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
 - B. American Concrete Institute (ACI)
 - 1. ACI 302.1R-04
- 1.03 SUBMITTALS
 - A. Quality Control / Assurance
 - 1. Manufacturer's samples, literature
 - 2. Manufacturer's installation instructions and details for placement, seaming and pipe boot installation

PART 2 – PRODUCTS

- 2.01 MATERIALS
 - A. Vapor Barrier must have all of the following qualities:
 - 1. Permeance of less than 0.01 Perms [grains/(ft² *hr * in.Hg)] per ASTM F 1249 or ASTM E 96; 15 mil thickness minimum
 - 2. ASTM E 1745 Class A
 - B. Vapor Barrier products:
 - 1. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC
 - 2. Zero Perm Vapor Barrier by Alumiseal
 - 3. Perminator by W.R. Meadows
 - 4. Substitutions: In accordance with Section 01 63 00
- 2.02 ACCESSORIES
 - A. Seam Tape:
 - 1. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96
 - B. Vapor Proofing Mastic:
 - 1. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96
 - C. Pipe Boots
 - 1. Construct pipe boots from pre-cut pipe boot vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 – EXECUTION

- 3.01 PREPARATION
 - A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
 - 1. Level and tamp or roll aggregate, sand or granular base.
- 3.02 INSTALLATION
 - A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.

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Under-Slab Vapor Barrier

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2. Lap vapor barrier over footings and/or seal to foundation walls.
 3. Overlap joints 6 inches and seal with manufacturer's tape.
 4. Seal all penetrations (including pipes) per manufacturer's instructions.
 5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.
- B. Manufacturer's representative to visit site during installation for submittal of site report to be provided to Architect; failure to do so shall give the Architect the option to reject the slab and vapor barrier installation.

END OF SECTION

Section 07 27 26

Fluid Applied Membrane Air Barriers

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PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes materials and installation of fluid applied waterproof air barrier membrane over vertical above grade concrete walls, concrete masonry walls, and wall sheathing.
- B. Related Requirements
 - 1. Section 03 30 00: Cast-In-Place Concrete
 - 2. Section 04 20 20: Brick Veneer
 - 3. Section 04 72 00: Architectural Cast Stone
 - 4. Section 07 60 00: Flashing and Sheet Metal
 - 5. Section 07 92 00: Joint Sealers
 - 6. Section 09 34 00: Portland Cement Plaster

1.3 DEFINITIONS

- A. Air Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air Barrier Auxiliary Material: A transitional component that provides air barrier continuity furnished by a source other than the primary air barrier manufacturer.
- D. Air Barrier Assembly: The collection of air barrier materials, accessory and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall

1.4 PRE-INSTALLATION MEETINGS

- A. Pre-installation Conference
 - 1. Review air barrier installation requirements and installation details, mock-ups, testing requirements, protection, and sequencing of work.

1.5 REFERENCES

- A. Building Code and Material Evaluation Service Standards
 - 1. ICC ES AC 212 – March 1, 2005, ICC Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing
 - 2. May, 1997, CCMC (Canadian Construction Materials Centre) Technical Guide for Air Barrier Material
 - 3. 2015 IBC, International Building Code
- B. ASTM Standards
 - 1. C 297-94, Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane
 - 2. C 1177-08, Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - 3. D 522-93a, Test Methods for Mandrel Bend Test of Attached Organic Coatings
 - 4. D 1970-00, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 5. D 3273-00, Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
 - 6. D 4541-09, Test Method Pull-Off Strength Coatings Using Portable Adhesion Testers
 - 7. E 84-98, Test Method for Surface Burning Characteristics of Building Materials
 - 8. E 96-00, Test Method for Water Vapor Transmission of Materials
 - 9. E 119-98, Standard Test Methods for Fire Tests of Building Construction and Materials
 - 10. E 779-10, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
 - 11. E 783-02, Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
 - 12. E 1186-03 (2009), Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
 - 13. E 1827-96 (2007), Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
 - 14. E 2178-03, Test Method for Air Permeance of Building Materials
 - 15. E 2357-05, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

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- D. APA - The Engineered Wood Association
 - 1. E30U-2007, Engineered Wood Construction Guide
 - E. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
 - 1. 2005 ASHRAE Handbook--Fundamentals
 - 2. ASHRAE 90.1 – 2010, Energy Standard for Buildings Except Low-Rise Residential Buildings
 - 3. ASHRAE 189.1 – 2009, Standard for the Design of High Performance Green Buildings Except Low-Rise Residential Buildings
 - F. National Fire Protection Association (NFPA)
 - 1. NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components
 - G. South Coast Air Quality Management District (SCAQMD)
 - 1. Rule 1113 (2007) – Architectural Coatings
- 1.6 COORDINATION/SCHEDULING
- A. The work in this section requires close coordination with related sections and trades. Sequence work to provide protection of construction materials from weather deterioration. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier.
 - B. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall.
 - C. Provide sill flashing to direct water to the exterior before windows and doors are installed.
 - D. Install window and door head flashing immediately after windows and doors are installed.
 - E. Install diverter flashings wherever water can enter the assembly to direct water to the exterior.
 - F. Install parapet cap flashing and similar at copings and sill to prevent water entry into wall assembly.
 - G. Install cladding within 180 days of waterproof air barrier installation.
- 1.7 SUBMITTALS
- A. Manufacturer's specifications, details and product data.
 - B. Manufacturer's standard warranty.
 - C. Manufacturer's ICC evaluation report confirming compliance with the IBC, IRC, and IECC as an air barrier and water-resistive barrier.
 - D. Samples for approval as directed by architect or owner.
 - E. Shop drawings: Illustrate substrate joints, cracks, flashing transitions, penetrations, corners, terminations, and tie-ins with adjoining construction, interfaces with separate materials that form part of the air barrier assembly.
- 1.8 QUALITY ASSURANCE
- A. Manufacturer requirements: Manufacturer of exterior wall waterproof air barrier materials for a minimum of 30 years in North America. ISO 9001:2008 Certified Quality System and ISO 14001:2004 Certified Environmental Management System
 - B. Contractor requirements: Knowledgeable in the proper use and handling of membrane materials. Employ skilled mechanics who are experienced and knowledgeable in waterproofing and air barrier application, and familiar with the requirements of the specified work. Provide the proper equipment, manpower and supervision on the job-site to install the air barrier assembly in compliance with the project plans & specifications, shop drawings, and Sto's published specifications and details.
 - C. Regulatory Compliance
 - 1. Primary air barrier and joint treatment reinforcement materials:
 - a. Listed by IBC and recognized for use on all types of construction.
 - b. Listed by CCMC and recognized for use on all types of construction.
 - c. Comply with VOC requirements of SCAQMD Rule 1113.
 - d. Comply with ASHRAE 90.1 – 2010
 - e. Comply with ASHRAE 189.1 - 2009
 - D. Mock-ups
 - 1. Build stand-alone site mock up or sample wall area on as-built construction to incorporate back-up wall construction, typical details covering substrate joints, cracks, flashing transitions, penetrations, corners, terminations, tie-ins with adjoining construction, and interfaces with separate materials that form part of the air barrier assembly.

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1.9 PRE-CONSTRUCTION TESTING

- A. Conduct testing by qualified test agency or building envelope consultant
 - 1. Conduct assembly air leakage testing in accordance with ASTM E 783.
 - 2. Conduct adhesion testing to substrates in accordance with ASTM D 4541.
 - 3. Conduct wet sealant compatibility testing in accordance with sealant manufacturer's field quality control test procedure.
 - 4. Notify design professional minimum 7 days prior to testing.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original sealed containers bearing manufacturer's name and product identification.
- B. Protect coatings (pail products) from freezing temperatures and temperatures in excess of 90 degrees F (32 degrees C). Store away from direct sunlight.
- C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.
- D. Protect and store accessory products in accordance with manufacturer's written instructions.

1.11 PROJECT/SITE CONDITIONS

- A. Maintain ambient and surface temperatures above 40 degrees F (4 degrees C) during application and drying period, minimum 24 hours after application of waterproof air barrier materials.
- B. Provide supplementary heat for installation in temperatures less than 40 degrees F (4 degrees C) or if surface temperature is likely to fall below 40 degrees F (4 degrees C).
- C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.12 WARRANTY

- A. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Sto Corp.
- B. Prosoco
- C. Approved Equal.
- D. Obtain primary air barrier and accessory air barrier materials from single source.

2.2 MATERIALS

- A. Primary Air Barrier Material: StoGuard with Sto Gold Coat - ready-mixed flexible spray or roller applied waterproof air barrier membrane material
- B. Accessory Materials
 - 1. Joint and Rough Opening Treatments
 - a. Sto Gold Fill® with StoGuard Mesh: ready mixed flexible trowel or spray applied air barrier material.
 - b. StoGuard® Rapid Seal™ with StoGuard Mesh: moisture cure elastomeric waterproof air barrier material (mesh not required at rough openings).
 - c. Sto Gold Coat with StoGuard Fabric: flexible waterproof air barrier membrane material
 - d. StoGuard Tape: self adhering rubberized asphalt tape with polyester fabric facing (for rough openings only).
 - 2. Joint Reinforcements
 - a. StoGuard Mesh: nominal 4.2 oz/yd² (142 g/m²) self-adhesive, flexible, symmetrical, interlaced glass fiber reinforcing mesh, with alkaline resistant coating for compatibility with Sto materials.
 - b. StoGuard Fabric: non-woven integrally reinforced cloth reinforcement.
 - c. StoGuard RediCorner™: non-woven integrally reinforced pre-formed cloth.
 - 3. Transition Membranes
 - a. Sto Gold Fill with StoGuard Mesh: ready mixed flexible trowel or spray applied air barrier material with treated glass fiber reinforcing mesh.
 - b. StoGuard RapidSeal or StoGuard RapidSeal with StoGuard Mesh: moisture cure elastomeric waterproof air barrier material with treated glass fiber reinforcing mesh (where applicable).

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- c. Sto Gold Coat with StoGuard Fabric: flexible waterproof air barrier membrane material with non-woven integrally reinforced cloth.
 - d. StoGuard Tape: self adhering rubberized asphalt tape with polyester fabric facing.
 - B. Primers
 - a. StoGuard Primer: rubber resin emulsion primer for use with StoGuard Tape to enhance adhesion and allow installation down to 35 degrees F (1.7 degrees C).
 - C. Auxiliary Materials
 - 1. Wet sealant: Dow Corning 758, 790, 791, and 795 sealants
 - 2. Pre-cured sealant tape: Dow 123
 - 3. Spray adhesive: 3M Super 77 Spray Adhesive
 - 4. Spray foam: Dow Great Stuff for Gaps and Cracks
 - D. Patching and Leveling Material for Concrete and Masonry
 - 1. Sto Leveler: polymer modified cementitious patch and leveling material for prepared concrete and masonry surfaces up to 3/8 inch (10 mm).
 - 2. Sto BTS Xtra: polymer modified lightweight cementitious patch and leveling material for prepared concrete and masonry surfaces up to 1/8 inch (3 mm).

2.3 PERFORMANCE REQUIREMENTS

- A. Durability, resistance to aging, water and water penetration resistance, structural loading: joint treatment and primary air barrier material, comply with ICC ES AC 212
- B. Flexibility: ASTM D 522, primary air barrier material, no cracking or delamination before and after aging using 1/8 inch (3 mm) mandrel at 14° F (10° C)
- C. Nail sealability: ASTM D 1970, 7.9.1, primary air barrier passes
- D. Material air leakage: ASTM D 2178, primary air barrier and joint treatment ≤ 0.004 cfm/ft² at 1.57 psf (0.02 L/s·m² at 75 Pa)
- E. Resistance to mold: ASTM D 3273, no mold growth after 28 day exposure
- F. Adhesion: joint treatment and primary air barrier material, ASTM C 297 or D 4541, ≥ 30 psi (207 kPa), or exceeds strength of glass mat facing on glass mat gypsum substrates
- G. Surface burning: ASTM E 84, joint treatment and primary air barrier material flame spread ≤ 25 , smoke developed ≤ 450 , Class A building material
- H. Water vapor permeance: ASTM E 96 Method B, > 1 perm (57 ng/Pa·s·m²)
- I. Fire resistance: ASTM E 119, meets requirements for a 1-hour fire-resistive rating when tested with up to 4 inches (102 mm) of continuous foam plastic insulation in a non-load-bearing steel frame wall assembly
- J. Fire propagation: NFPA 285, meets requirements for use on all Types of construction with up to 12 inches (305 mm) of continuous EPS foam plastic insulation without height restriction
- J. Assembly air leakage: ASTM E 2357, ≤ 0.04 cfm/ft² (0.2 L/s·m²) air leakage after conditioning protocol
- K. Field adhesion testing: ASTM D 4541, ≥ 30 psi (207 kPa) or exceeds strength of glass mat facing on glass mat gypsum substrates
- L. Building envelope air leakage: ASTM E 779 or 1827, ≤ 0.4 cfm/ft² (2 L/s·m²)
- M. Volatile Organic Compounds: SCAQMD Rule 1113, joint treatment, air barrier material ≤ 100 g/L
- N. Water-resistive barrier: ICC ES 212, joint treatment and primary air barrier comply and are listed in a valid ICC ESR.

2.4 DESIGN CRITERIA

- A. Structural (Wind and Axial Loads)
 - 1. Design for maximum allowable deflection normal to the plane of the wall: L/240.
 - 2. Design for wind load in conformance with code requirements.
- B. Moisture Control
 - 1. Prevent the accumulation of water in the wall assembly and behind the exterior wall cladding:
 - a. Minimize condensation within the assembly.
 - b. Drain water directly to the exterior where it is likely to penetrate components in the wall assembly (windows and doors, for example).
 - c. Provide corrosion resistant flashing to direct water to the exterior in accordance with code requirements, including: above window and door heads, beneath window and door sills, at roof/wall intersections, floor lines, decks, intersections of lower walls with higher walls, and at the base of the wall.
- C. Air Barrier Continuity: provide continuous air barrier assembly of compatible air barrier components.
- D. Substrates

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1. Concrete Masonry Units: provide normal weight units with flush joints (struck flush with the surface) and allow for a minimum of 2 coats of the primary air barrier material, or a cementitious parge coat to fill and level irregular surfaces and 1 coat of the primary air barrier material, prior to the air barrier application, such that a void and pinhole free air barrier surface is achieved.
- E. Mechanical Ventilation: maintain pressurization and indoor humidity levels in accordance with recommendations of ASHRAE (see 2005 ASHRAE Handbook—Fundamentals).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect sheathing application for compliance with applicable requirement:
 1. Exterior Grade and Exposure I wood based sheathing: E30U-2007, Engineered Wood Construction Guide, and the requirements of the applicable building code.
 2. Glass mat faced gypsum sheathing in compliance with ASTM C 1177: consult manufacturer's published recommendations and ICC ES Report. Conform with project requirements for wind load resistance.
 3. Cementitious sheathing — Consult manufacturer's published recommendations and ICC ES Report. Conform with project requirements for wind load resistance.
- B. Report deviations from the requirements of project specifications or other conditions that might adversely affect the waterproof air barrier installation. Do not start work until deviations are corrected.

3.2 SURFACE PREPARATION

- A. Sheathing
 1. Remove and replace damaged sheathing.
 2. Spot surface defects such as over-driven fasteners, knot holes, or other voids in sheathing with knife grade joint treatment material.
 3. Spot fasteners with knife grade or coating joint treatment material.

3.3 INSTALLATION

- A. Coordinate work with other trades to ensure air barrier continuity with connections at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line.
- B. Rough opening protection
 1. Install transition membrane into and around rough opening. Refer to Sto details 20.03a-e and applicable Sto product bulletins.
- C. Sheathing joints
 1. Install joint treatment material with applicable reinforcement over sheathing joints. Refer to Sto detail 20.00a and applicable Sto product bulletins.
- D. Transitions
 1. Install air barrier accessory materials (with reinforcement where applicable), or auxiliary material at transition areas: foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line. Refer to Sto Tech Hotline No. 0211-BSc and applicable Sto product bulletins.
- E. Waterproof air barrier membrane
 1. Concrete – install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to prepared concrete substrate. Don't install over working/moving joint sealants.
 2. Concrete Masonry - install one liberal coat of Sto Gold Coat by spray or roller in a uniform, continuous film to the prepared concrete masonry substrate. Backroll spray applications. Allow to dry. Install a second liberal coat in a uniform, continuous film, and backroll spray applications, to achieve a void and pinhole free surface. Depending on the condition of the surface a minimum of 10 wet mils up to a maximum of 30 wet mils per coat is required. Apply additional coats if needed to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.
 3. Sheathing
 - a. Glass mat faced gypsum sheathing: install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared glass mat gypsum

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substrate to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.

- b. Plywood sheathing: install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared substrate to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.
- c. OSB sheathing: install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared substrate and allow to dry. Install a second coat in a uniform, continuous film of 10 wet mils to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.

3.4 FIELD QUALITY CONTROL

- A. Owner's qualified testing agency or building envelope consultant shall perform inspections and tests.
- B. Inspections: air barrier materials are subject to inspection to verify compliance with requirements.
 - 1. Condition of substrates and substrate preparation.
 - 2. Installation of primary air barrier material, accessory materials, and compatible auxiliary materials over structurally sound substrates and in conformance with architectural design details, contractor's shop drawings, project mock-up, and manufacturer's written installation instructions.
 - 3. Air barrier continuity and connections without gaps and holes at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line.
- B. Tests: air barrier materials and assembly are subject to tests to verify compliance with performance requirements:
 - 1. Qualitative air leakage test: ASTM E 1186
 - 2. Quantitative air leakage test: ASTM E 779, E 783, and E 1827
 - 3. Adhesion test: ASTM D 4541
 - 4. Qualitative adhesion and compatibility testing: wet sealant manufacturer's field quality control adhesion test. Repair non-conforming substrates and air barrier material installation to conform with project requirements.
- C. Take corrective action to repair and replace, reinstall, seal openings, gaps, or other sources of air leakage to conform with project performance requirements.

3.5 PROTECTION AND CLEANING

- A. Protect air barrier materials from damage during construction caused by wind, rain, freezing, continuous high humidity, or prolonged exposure to sunlight.
- B. Protect air barrier materials from damage from trades, vandals, and water infiltration during construction.
- C. Repair damaged materials to meet project specification requirements.
- D. Clean spills, stains, soiling from finishes or other construction materials that will be exposed in the completed work with compatible cleaners.
- E. Remove all masking materials after work is completed.

END OF SECTION

Section 07 41 13 Prefinished Metal Roofing

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CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable, apply to this Section.

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish all labor, materials, tools, equipment and services for preformed metal roofing.
- B. Coordinate with work of other trades.
- C. It is the intent of this Section that the Work shall:
 - 1. conform to all applicable building code requirements and of authorities having jurisdiction;
 - 2. include, but not be limited to:
 - a. Preformed, prefinished metal roof panels
 - b. Roof insulation
 - c. Vapor barrier
 - d. Substrate board, if shown or required by authorities having jurisdiction.
 - e. Metal deck
 - f. Flashings
 - g. Gutters, Downspouts and Splash Blocks
 - h. Roof jacks
 - i. Roof curbs
 - j. All supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, weathertight, and complete installation.
 - 3. be performed by a single source contractor.

1.2 RELATED WORK

- A. Division 5 Sections as required; generally: structural steel, steel joists, and steel deck.
- B. Section 07 62 00, Sheet Metal Flashing, Gutters, Downspouts and Trim (Roof Related Sheet Metal)
- C. Division 22, 23 and 26: All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing and electrical items penetrating roofing system.

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - 2. A792, Specifications for Steel Sheet, Aluminum-Zinc Alloy-Coated (Galvanized) by the Hot-Dip Process, General Requirements ("Galvalume")
 - 3. C1289, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- B. Underwriters' Laboratories (UL)
 - 1. Tests for Uplift Resistance of Roof Assemblies
 - 2. Tests for Impact Resistance of Roofing Materials

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- C. International Building Code, 2018 Edition
- D. ASCE 7-10, Wind uplifts requirements for geographical

1.4 DELEGATED DESIGN SUBMITTAL

- A. Roof system design and calculations shall be performed and prepared by the Roofing Manufacturer, based on empirical test data, applicable codes and standards, and project specific requirements.
- B. Design and Structural analysis data and calculations shall be signed and sealed by a Registered Professional Engineer, licensed in the State of Louisiana, responsible for their preparation, to certify conformance with project specific design loads and governing code requirements as described herein and as indicated on the drawings.
- C. Approval Drawings and "For Construction" Drawings shall be prepared, signed and sealed by a Registered Professional Engineer, licensed in the State of Louisiana, who is responsible for their preparation, to certify conformance with project specific design loads and governing code requirements as described herein and as indicated on the drawings.
- D. Design/Code Requirements: Roofing system shall be designed in accordance with the requirements of the following Codes, Standards, and other criteria:
 - 1. IBC-2021
 - 2. ASCE-7-16 wind uplift requirements for "Components & Cladding", based on the project's specific geographical location, zone and topographical characteristics.
 - 3. Risk Category: "III"
 - 4. Exposure Category: "C"
 - 5. 142 MPH, 3-second gust wind speed
- E. Engineering Calculations: Engineering calculations defining cladding loads on all roof areas based on specified building codes, allowable clip loads, and required number of fasteners to secure the panel clips to the designated substructure.
 - 1. Calculate wind uplift requirements for the following roof zone conditions:
 - Zone 1 - Field
 - Zone 2 - Perimeter
 - Zone 3 - Corner
 - Zone 4 - Perimeter / Overhang
 - Zone 5 - Corner / Overhang
 - 2. Calculate uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading. Calculate holding strength of fasteners in accordance with submitted test data provided by fastener manufacturer based on length of embedment and properties of materials.
- F. Certifications:
 - 1. Engineering Certification Letter, with Seal and Signature of the Louisiana licensed Professional Engineer responsible for the design, and listing the applicable design criteria.

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2. Letter of certification from manufacturer that installer is in compliance and meets the specified requirements.
3. Letter of certification from manufacturer that panels have been produced in accordance with strictest applicable standards to ensure quality.
4. Certified test results by a recognized testing laboratory or manufacturer's laboratory (witnessed by a professional engineer) in accordance with specified performance test methods for each panel system provided.
5. Manufacturer's certification that materials are in compliance with the specifications, including but not limited to finish and panel material.
6. Manufacturer's affidavit that materials used in Project contain no asbestos.
7. Testing Reports: Showing metal panels have been tested in accordance with specified the performance testing requirements.

1.5 INSPECTIONS / TESTS

- A. The Project Manager and Manufacturer's representative shall at all times have access to the job site and work areas. The General Contractor/Design-Builder will provide proper and safe facilities for such access and inspection.
 1. Project Manager's Inspections: The Project Manager will perform periodic inspections throughout the duration of the project. The Project Manager shall inspect after completion of each major phase of construction for approval.
 2. Manufacturer Inspections:
 - a. An inspection shall be made by a representative of the material manufacturer a minimum three (3) times monthly during performance of Work to ensure that said project is installed in accordance with the manufacturer's specifications and illustrated details. Written reports by the manufacturer shall be turned over to the Project Manager, on each Monday following the prior week.
 - b. The authorized material manufacturer's field representative shall be responsible for:
 - 1) Keeping the Project Manager informed after periodic inspections as to the progress and quality of the work observed.
 - 2) Calling to the attention of the General Contractor/Design-Builder those matters observed which are considered to be in violation of the Contract requirements.
 - 3) Reporting to the Project Manager, in writing, any failure or refusal of the General Contractor/Design-Builder to correct unacceptable practices called to his attention.
 - 4) Confirming, after completion of the work and based on his observation and test, that he has observed no application procedures in conflict with these Design Standards.
- B. Any failure by the Project Manager or Manufacturer's Representative to detect, pinpoint, or object to any defect or noncompliance of these Design Standards of work in progress or completed work shall not relieve the General Contractor/Design-Builder, or reduce, or

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in any way limit, his responsibility of full performance of work required of him under these Design Standards.

- C. Project Manager may require tests and inspections as necessary to verify quality of roofing materials and workmanship. Laboratory tests will be performed in accordance with ASTM standard procedures.
1. The General Contractor will select testing laboratory and will pay for Work required by testing laboratory.
 2. Re-tests for work which fail initial tests or inspections shall be paid by the General Contractor.
 3. Non compliance with test requirements will result in the Owner to assign full time quality control and will be subject to reimbursement by the General Contractor.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
1. Manufacturer must have a minimum of three (3) years experience manufacturing roof panels of the type specified for this Project. Panels specified in this Section shall be produced in either a factory environment with fixed-based roll forming equipment or by a certified manufacturer approved portable roll forming system to ensure the highest level of quality control. A letter certifying compliance shall accompany the product material submittal.
- B. Installer's Qualifications:
1. Installer of the system shall be an approved installer, certified and authorized by the manufacturer as trained and qualified to install the manufacturer's product. Provide a letter of certification from manufacturer that installer has a minimum of three (3) year of successful metal roof panel installation experience preceding the date upon which work is to commence.

1.6 SUBMITTALS

The following items shall be submitted in a letter issued by the Roof Manufacturer, along with the roofing submittals, prior to the Roofing Pre-Installation Conference:

- **Certification by the Roofing Manufacturer that the installer is an "Approved Applicator", in good standing, and specifically stating that the installer is both acceptable and authorized to install the proposed roofing system(s), including all required warranties.**
- **Certification by the Roofing Manufacturer that the proposed system will comply with the manufacturer's requirements, in order to qualify the project for all specified warranties and guarantee(s).**
- **Certification by the Roofing Manufacturer that the required warranties will be issued, utilizing the State of Louisiana, Department of Facility Planning & Control (FP&C) standard warranty forms, without exclusion or exception.**
- **Certification that the Roofing Manufacturer will provide the required full 20 year, No Dollar Limit, Non-Prorated, Weathertightness Warranty.**

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- **Manufacturer agrees that the Louisiana 19th Judicial Court will be the location for conducting legal proceedings.**

- A. Product Data:
 - 1. Manufacturer's Design Standards and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.

- B. Shop Drawings: Include layouts of panels, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashing, closures and special details. Distinguish between factory and field assembly work.

- C. Calculations:
 - 1. Engineering calculations defining cladding loads on all roof areas based on specified building codes, allowable clip loads and required number of fasteners to secure the panel clips to the designated substructure.
 - 2. Uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading. Calculate holding strength of fasteners in accordance with submitted test data provided by fastener manufacturer based on length of embedment and properties of materials.
 - 3. Structural analysis data and calculations shall be signed and sealed by a professional engineer licensed in the State responsible for their preparation to certify conformance with project specific design loads and governing code requirements as described herein and indicated on the drawings
 - 4. Roofing system shall be installed in accordance with ASCE-7 wind uplift requirements for geographical location and IBC requirements.

- D. Samples:
 - 1. Color charts or samples from the manufacturer's standard line of Kynar 500 or Hylar 5000 finishes for Project Manager's selection.
 - 2. One (1) foot long sample of coated panel, including clips and fasteners.

- E. Certifications:
 - 1. Letter of certification from manufacturer that installer is in compliance and meets specified requirements.
 - 2. Letter of certification from manufacturer that panels have been produced in accordance with strictest applicable standards to ensure quality.
 - 3. Certified test results by a recognized testing laboratory or manufacturer's laboratory (witnessed by a professional engineer) in accordance with specified performance test methods for each panel system.
 - 4. Manufacturer's certification that materials are in compliance with the specifications, including but not limited to finish and panel material.
 - 5. Manufacturer's affidavit that materials used in Project contain no asbestos.

- F. Testing Reports: Showing metal panels have been tested in accordance with specified performance testing requirements.

- G. Field Reports: Required for conformance with warranty requirements specified below.

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- H. **THE OWNER'S (FP&C) ROOF WARRANTIES ARE REQUIRED AND MAY NOT BE SUBSTITUTED WITH THE MANUFACTURER'S WARRANTY OR ANY OTHER WARRANTIES.**

1.7 PRE-INSTALLATION CONFERENCE

- A. Refer to Section 01 31 19 – Meetings.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver metal roof system to job site properly packaged to provide protection against transportation damage.
- B. Handling: Exercise extreme care in unloading, storing and erecting metal roof system to prevent bending, warping, twisting and surface damage.
- C. Storage:
1. Store all materials and accessories above ground on well skidded platforms.
 2. Store under waterproof covering.
 3. Provide proper ventilation of metal roof system to prevent condensation build-up between each panel of trim/flashing component.

1.9 WARRANTY

- A. **THE OWNER'S (FP&C) ROOF WARRANTIES ARE REQUIRED AND MAY NOT BE SUBSTITUTED WITH THE MANUFACTURER'S WARRANTY OR ANY OTHER WARRANTIES.**

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. MANUFACTURERS SHALL BE LIMITED TO THE FOLLOWING (no substitutions allowed):
1. **Pac Clad – “238T - Symmetrical Panel System”**
 2. **Berridge – Tee-Lock Panel System (Basis of Design)**
- B. Materials shall be manufactured, specified, or accepted in writing by roofing manufacturer. Proposed materials shall ensure full system warranty from the Owner.
- C. Roof panels with lap type side joints or those requiring battens or other non-integral sealing means or exposed structural fasteners will not be acceptable.
- D. Roof panels shall be roll formed in the manufacturer's plant to control quality or by certified/calibrated/approved on-site roll-forming equipment only by panel manufacturers approved installers.

2.2 MATERIALS

- A. Metal Standing Seam Roof Panel:

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1. Materials:
 - a. Sheet Material: Prefinished Galvalume Sheet Steel - ASTM 792-AZ-50.
 - b. Finish: Full strength Kynar 500 or Hylar 5000 Fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to tests for adhesion, flexibility, and longevity as specified by the Kynar 500 or Hylar 5000 finish supplier. Color shall be selected by Project Manager from manufacturer's available colors (anticipated color is Sate Greay.
 - c. Touch-up Paint: Paint burns, scars, welds, and damaged and rusted surfaces with cold galvanizing paint in accordance with ASTM A780. Products include ZRC Cold Galvanizing Compound manufactured by ZRC Chemical Products, Quincy, MA; Galvax Zinc-rich Cold Galvanizing Coating manufactured by Alvin Products, Inc., Lawrence, MA; or paint complying with military specification MILP-21035A, Type I or II.
 - d. Strippable Film: Applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. Remove strippable film prior to installation.
 - e. Accessories:
 - 1) General: Provide all components required in accordance with the metal roof system manufacturer's approved shop drawings for a complete metal roof system to include panels, panel clips, trim/flashings, fascias, ridge, closures, sealants, fillers, and other required items.
 - 2) Fasteners: Stainless Steel with washers and manufacturer's panel clips spaced according to engineers calculations as instructed for wind uplift requirements.
 - 3) Weatherseal: manufacturers approved weatherseal applied continuously along locking seam prior to seaming
 2. **Profile/Dimensions: 16 inch wide (nominal), symmetrical profile roof panel, with two (2) 2-3/8" high vertical legs located at each edge. Panels shall be mechanically seamed together, utilizing a seam cap, of material and color to match the adjacent roof panels, to form a single, structural, and weathertight joint. The seam cap shall be machine-removable, in the event a single or group of panels within the field of the roof should ever need to be replaced. All panels shall be continuous in length from eave to ridge, with no intermediate laps. Panel shall be striated full length panel, to minimize the effects of oil-canning. The panel shall have no exposed fasteners, either at the low eave, ridge, or midpoint (if fixed).**
 3. Roof assembly shall bear Underwriters Laboratories Label UL90.
- B. Accessories:
1. Insulation Board: Four (4) inch thick closed cell glass reinforced poly-isocyanurate insulation board complying with ASTM C1289, Type I, Class 2 and FS HH-I-1972/1, Class 2.

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2. Substrate Board: Glass-Faced Gypsum Roof Board equal to UL rated Type X "Dens Deck Prime" manufactured by Georgia-Pacific. Board size shall be 48 inches by 96 inches by 1/2 inch, unless noted otherwise. Provide primer as recommendation or required by manufacturer for Roof System.
3. Waterproofing Membrane: 60 mil thick, high temperature, SBS modified bituminous product of self-adhering type with non-stick surface conforming to "TAMKO TW-Metal and Tile Underlayment" manufactured by Tamko Roofing Products, Inc., or approved equal. Surface shall be smooth, non-granulated to prevent damage to the finish at the bottom side of the panels.
4. **Prefabricated Roof Curbs: Curbs shall be one-piece, all welded galvanized or aluminum, and shall be fixed to the roof structure. The roof manufacturer shall provide a "floating" flashing condition, to allow for thermal expansion of the roof system around the fixed curb. The roof curb flashing condition shall be specifically included in the 20 year, No Dollar Limit Weathertightness warranty, and shall not be excluded.**
5. Equipment Supports, Roof Jacks, and Rooftop Walkways: Shall be product(s) of manufacturer(s) approved by the metal roof system manufacturer, so as to avoid any conflict of warranty and as specified elsewhere in the Specifications and/or Drawings.
6. Closures: Outside closures shall be fabricated from Galvalume® sheet steel of the same gauge, finish and color as the panels. Galvanized base material is unacceptable. Outside closures consisting of a fabricated Galvalume sheet with a neoprene insert to conform and seal to the roof panel profile are acceptable.
7. Tape Seal: Pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape seal approved by the metal roof system manufacturer.
8. Joint Sealant: One-part elastomeric polyurethane sealant approved by the metal roof system manufacturer.
9. Splash Blocks: Refer to Section 07 62 00, Sheet Metal Flashing, Gutters, Downspouts and Trim.
10. Gutter Screens: Refer to Section 07 62 00, Sheet Metal Flashing, Gutters, Downspouts and Trim

2.3 FABRICATION

- A. Material shall be in-line tension leveled prior to roll forming panel profile.
- B. Exposed adjacent flashing shall be of the same material and finish as the roof panels.
- C. Hem all exposed edges of flashing on underside, 1/2 inch.

2.4 PREFABRICATED ROOF CURBS AND EQUIPMENT SUPPORTS

- A. General: Comply with loading and strength requirements as indicated where units support other work. Coordinate dimensions of curbs and supports with equipment supplier/manufacturer.

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- B. **Prefabricated Roof Curbs:** Curbs shall be one-piece, all welded galvanized or aluminum, and shall be fixed to the roof structure. The roof manufacturer shall provide a "floating" flashing condition, to allow for thermal expansion of the roof system around the fixed curb. The roof curb flashing condition shall be specifically included in the 20 year, No Dollar Limit Weathertightness warranty, and shall not be excluded.
- C. Fabricate curbs of structural quality 0.080 inch aluminum, factory baked finished after fabrication in coating compatible with and matching roof panel finish, with mitered and continuously welded corner joints. Provide integral base plates and water diverter crickets. Front base plate shall be a minimum of 18 inches from beginning of water diverter. Curbs shall be designed to install under metal roof system on the high side and over the metal roof system on the low side.
- D. Curbs shall be of size and design shown on the drawings or required, with minimum height of eight (8) inches above finished metal roof system.
- E. Curbs shall be constructed to match slope of roof and provide a level top surface for mounting equipment in a level horizontal position, unless shown otherwise.
- F. Curb flanges shall be constructed to match configuration of roof panels.
- G. Coordinate work with mechanical installer to ensure matching finish of curbs provided for roof mounted mechanical equipment.

2.5 PREFABRICATED ROOF JACKS

- A. Pipe flashings shall be one piece EPDM (ethylene propylene diene monomer) molded rubber boot having a serviceable temperature range of minus 60 degrees F to 270 degrees F and shall be resistant to ozone and ultraviolet rays. Units shall have an aluminum flanged base ring.
- B. Provide high temperature rated rubber roof jacks at hot stacks as applicable, including but not limited to boiler flues, heater vents, steam relief, or similar conditions. Rating minimum of 400 degrees F.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
- B. Verify that installation is made in accordance with approved shop drawings and manufacturer's instructions. This specifically includes verifying the secondary structural members and decking are installed to meet UL and governing building code

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requirements. Coordinate with metal roof system manufacturer to insure that clip spacing at eave, rake, ridge and corner areas are accommodated to meet UL90 requirements as calculated by manufacturer's engineer.

- C. Discrepancies:
 - 1. Bring discrepancies to the attention of the Project Manager.
 - 2. Do not proceed with installation until discrepancies have been resolved.

3.2 INSTALLATION OF METAL ROOFING OVER METAL DECK

- A. Install steel deck, to meet structural design wind uplift requirements.
- B. If shown or required, install fire rated substrate board over metal deck in conformance with approved shop drawings and manufacturer's instructions.
- C. If shown or required, install insulation over substrate board.
- D. If shown or required, install vapor barrier over insulation in conformance with approved shop drawings and manufacturer's instructions. Lap and tape seal all joints.
- E. Remove protective strippable plastic film covering from metal roof panels, trim, and related items when and in conformance manufacturer's instructions, where applicable.
- F. Install metal roof system so that it is weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction. Isolate dissimilar metal contact with proper taping and/or coatings.
- G. Install metal roof panels, trim, and related items in accordance with approved samples with approved shop drawings and manufacturer's instructions.
- H. Provide concealed anchors at all panel attachment locations.
- I. Install panels plumb, level and straight with seams and ribs parallel, conforming to design as indicated.
- J. Install roof jacks in accordance with approved shop drawings and manufacturer's instructions. Install roof jacks in flat of the roof panel. Coordinate location so roof panel seams are not altered.
- K. Install roof curbs in accordance with approved shop drawings and manufacturer's instructions. Anchor curbs securely in place with provisions for thermal and structural movement.
- L. Install gutters and downspouts in accordance with approved samples and approved shop drawings and manufacturer's instructions.
 - 1. Provide expansion joints on gutters spaced maximum 50 feet on center. Install snap-on cover over expansion joint.
 - 2. Install downspouts according to Section 07 62 00.
- M. Install splash pad or block over a protection (walkway) pad for downspouts located at roof level.

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- N. Install gutter screens over installed gutter. Secure screen to spacer with self-tapping screw.

3.3 CLEANING AND PROTECTION

- A. Remove scraps and debris and leave work area clean.
- B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. **Painting areas where finish is damaged on prefinished metal by painting is not acceptable; replace damaged panel/item with non-damaged item.**
- C. Clean other work damaged or soiled by Work of this Section.
- D. Protect finished work from damage.

END OF SECTION

Section 07 42 00

Metal Wall Panels

Specifications

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PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. The extent of panel system work is indicated on the drawings and in these specifications.
 - 2. Panel system requirements include the following components:
 - a. Aluminum panels with mounting. Panel mounting including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.
 - b. items indicated as integral components of the panel system or as designed.
- B. Related Sections:
 - 1. Section 05 12 00 - Structural Steel Framing: Structural steel building frame.
 - 2. Section 07 60 00 - Sheet Metal Flashing and Trim
 - 3. Section 07 92 00 - Joint Sealers.
 - 4. Section 05 40 00 - Cold Formed Metal Framing: Metal Stud Framing at exterior walls.

1.2 REFERENCES

- A. Aluminum Association:
 - 1. AA ADM 1 - Aluminum Design Manual.
 - 2. AA ASM 35 - Aluminum Sheet Metal Work in Building Construction.
- B. American Society of Civil Engineers:
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International:
 - 1. ASTM E283
 - 2. ASTM E1592
 - 3. ASTM E331 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.3 SYSTEM DESCRIPTION

- A. System: Preformed and prefinished metal building panel system of vertical profile; site assembled; with exposed fasteners.

1.4 PERFORMANCE REQUIREMENTS

- A. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code
 - 1. Design Pressure: Minimum 20 lb/sq ft.
- B. Maximum Allowable Deflection of Panel: 1/90
- C. Movement: Accommodate movement within system without damage to system, components, or deterioration of seals; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing, and mid-span slab edge deflection.
- D. Drainage: Provide positive drainage to exterior for moisture entering, condensation within panel system.
- E. Tolerances: Accommodate tolerances of building structural framing.
- F. Products: Provide continuity of thermal barrier at building enclosure elements in conjunction with adjacent thermal insulating materials.
- G. Vapor Retarder: Provide continuity of vapor retarder at building enclosure elements in conjunction with vapor retarders specified in Section 07 26 00.
- H. Air Seal: Provide continuity of Weather Barrier seal at building enclosure elements in conjunction with air seal materials specified in Section 07 27 00.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Signed and sealed by professional engineer.

Section 07 42 00 Metal Wall Panels

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1. Indicate dimensions, panel profile and layout, spans, joints, expansion joints, construction details, methods of anchorage, method of installation and interface with adjacent materials.
 2. Include design calculations.
 - C. Product Data:
 1. Submit panel profile characteristics and dimensions, and structural properties.
 2. Submit data on assembled panel structural capabilities.
 - D. Samples: Submit two samples of panel 18 x 18 inch in size illustrating finish color, sheen, and texture.
 - E. Manufacturer's Installation Instructions: Submit special handling criteria, installation sequence, and cleaning procedures.
- 1.6 QUALITY ASSURANCE
 - A. Perform Work in accordance with AA ASM-35
- 1.7 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
 - B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- 1.8 DELIVERY, STORAGE, AND HANDLING
 - A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
 - B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
 - C. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
 - D. Prevent contact with materials capable of causing discoloration or staining.
- 1.9 COORDINATION
 - A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
 - B. Coordinate Work with placement of anchors.
 - C. Coordinate Work for installation of vapor retarder and Weather Barrier seals.
 - D. Coordinate Work with installation of adjacent components and materials.
- 1.10 WARRANTY
 - A. Warranty: Manufacturer's thirty year warranty in which manufacturer agrees to repair finish or replace wall panels that show evidence of deterioration of factory-applied finish and/or rupture, structural failure or perforation due to corrosion, within specified warranty period.
 1. Exposed Panel Finish warranty requirements:
 - a. Color fading more than 5 hunter units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling or failure of paint to adhere to a bare metal.
 2. Warranty Period: 30 years from the date of Substantial Completion of the project for panel finish, and 5 years for weathertightness.
 - B. Applicator shall furnish written warranty for a two year period from the date of Substantial Completion of building covering repairs required to maintain panel system in watertight condition.

PART 2 PRODUCTS

- 2.1 PANELS
 - A. Manufacturers
 1. Petersen Aluminum Pac-Clad: Flush panel (vertical install) and HWP (horizontal install)
 2. Berridge: L-panel (vertical install) and HR-16 (horizontal install)
 3. Substitutions: 01 25 13

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2.2 PANEL DESIGN

- A. General: Provide factory-formed, prefinished, lappable exposed fastener, structural ribbed metal wall panel system that has been pretested and certified by manufacturer to comply with specified requirements under installed conditions.
- B. Panels shall be exposed fastener R-panels with 13/4 inch deep profile ribs, 18 inches on center
- C. Structural Requirements: Engineer panels for structural properties in accordance with latest edition of American Iron and Steel Institutes Cold Formed Steel Design Manual using effective width concept and Aluminum Associations Aluminum Design Manual.
- D. Forming: Use continuous end rolling method; no end laps on panels. It is the intent of the Architect to provide factory-manufactured panel systems for this project.
- E. Panels shall be directly fastened to the substrate, with an overlapping sidelap feature.

2.3 MATERIALS AND FINISHES

- A. Panels shall be fabricated of .032 aluminum.
- B. Color: **Architect to select from Manufacturer's full range of colors.**
- C. Texture shall be smooth.
- D. Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting. Trim to be fabricated in accordance with standard SMACNA procedure and details.
- E. Closures shall be pre-molded manufacturer standard, to match the profile of the exposed fastener panel and shall be in lengths as supplied by manufacturer.
- F. Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting all wind forces, as required by all applicable codes. Exposed fasteners shall not restrict free movement of the panel system resulting from thermal forces, except at designed points of roof panel fixity.
 - 1. Fasteners shall have combination steel and EPDM washers.
 - 2. Fasteners shall be applied in accordance with manufacturer-provided fastening schedule.
 - 3. Screws for flashings and sidelaps shall be #14 HHA x 3/4" sheet metal stitch screws or equal.
 - 4. All accessories, flashings and sidelaps shall be fastened at 12 inches o.c. minimum.
- G. Caulking: Sealants shall be silicone; all sealing shall be done in a neat manner, removing all excess.
- H. Joint laps shall be manufacturer supplied tape or silicone sealant, accommodating thermal movement.

2.4 FABRICATION

- A. Fabricate in factory; fabrication of component profiles on site is not permitted.
- B. Form sections to shape indicated on Drawings, accurate in size, square, free from distortion, defects.
- C. Form pieces in longest practicable lengths.
- D. Panel Profile: as indicated on Drawings.
- E. Fabricate corners in one continuous piece with minimum 18 inch returns.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate is ready to receive panel system.

3.2 INSTALLATION

- A. Protect panel surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- B. Permanently fasten panel to substrate; aligned, level, and plumb, within specified tolerances.
- C. Locate panel screw attachments over supports.
- D. Install joints to allow for expansion if appropriate.
- E. Use fasteners provided by manufacturer.
- F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

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3.3 ERECTION TOLERANCES

- A. Maximum Offset From Indicated Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

3.4 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Remove site cuttings from finish surfaces.
- C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.7 WARRANTY

- A. The project will not be accepted until the warranty is executed in strict accordance with the Contract Documents and data from below in these Instructions and have been submitted to and accepted by the Owner; length of warranty is 30-year, non-prorated for finish and weathertightness.
 - 1. The applicable guarantee form is to be made a part of the specifications and bound with same in the specification manual. Additionally, paragraphs are to be inserted in the technical specification section to convey the following intent:
 - a. The wall panels and associated work, as defined in "c)" below, shall be guaranteed against leaks from faulty or defective materials and workmanship for an applicable period shown on guarantee, starting on the date of Substantial Completion of the project.
 - b. The "Guarantee" shall be executed in duplicate, signed by the appropriate parties and submitted to Owner processed through the Architect.
 - c. The definition of the system which are to be specified and guaranteed in the appropriate Section of the Specifications includes the materials and methods used from the surface of the sheathing. Items included in the warranty shall include end and termination pieces, closures, etc. (all items necessary to prevent water, weather, and pest infiltration).
 - d. The Warranty shall include ALL requirements of this Section 07 42 00, and all that it implies.

END OF SECTION

4. RECOMMENDED AGENDA FOR ROOFING CONFERENCES

Project Name: _____

Conference Location: _____ Date: _____

Type of Conference: _____Preliminary _____Pre-Application

Architect: _____

Roofing Contractor: _____

General Contractor: _____

CONFERENCES ATTENDEES:

[illegible]

AGENDA FOR PRELIMINARY ROOFING CONFERENCE

PURPOSE: Establish a direct line of communication, iron out initial questions regarding the project and to review project submittal requirements.

TIMING: The meeting should be held shortly after award of the Contract and at least six weeks prior to the anticipated start of roofing.

1. A complete set of Contract Documents (plans and specifications) to be available for review.
2. All meeting minutes to be furnished to all parties. Establish project record keeping procedures.
3. Review tentative progress schedule for roofing. Set approximate date.
4. Review roofing system and insulation requirements.
5. Weather considerations as they may apply to the project roofing installation.
6. Temporary roofing guidelines for the project. Who and when will final decision be made, if necessary.

7. Inspection and Testing Requirements:
____ Name of
Inspection Firm:
Name of inspector:
Phone:

-
- a. On-Site Inspection - Discuss project requirements.
 - b. Laboratory Tests

8. Roof Deck:

Type and Thickness:

Slope: ____ Location and Type of Drains:

Tentative Schedule for Erection:

Nailers, curbs and sheet metal must be completed prior to roofing application. Review FM or UL requirements

9. Anticipated material storage areas and equipment set-up locations touched upon. Review requirements.

10. Specific submittals from the Roofing Contractor:

- a. Material approval list
- b. Shop drawings (if any)
- c. Product material brochures and samples
- d. Manufacturer's Guarantee review for compliance with specifications

11. Specific project detail discussion. (Include perimeter wall construction and rooftop mechanical equipment details.)

12. Other:

13. Review above items briefly and establish date for tentative Pre-Application Conference.

AGENDA FOR ROOFING PRE-APPLICATION CONFERENCE

PURPOSE:

- To verify readiness of the project structure
- To review assignments of Preliminary Conference
- To scan last minute details, changes or corrections
- To review anticipated schedule of progress

TIMING: Within one week of roofing application

ATTENDANCE: List attendees

(The roofing job superintendent or foreman and the project roofing inspector should attend this meeting.)

1. Copies of approved submittals should be available for review. Are any material changes required due to availability problems or other? Reminder that formal approvals are still required.
2. Review minutes of Preliminary Conference.
3. Discuss revised Roofing Application Schedule.
4. Equipment set-up and on-site material storage.
5. Deck Readiness:
 - a. Any required roof deck certifications must be in order
 - b. Rooftop inspection by those in attendance
 - c. Drain hookups complete
 - d. Curbs, nailers, roof deck penetrations, perimeter edges and mechanical equipment - should all be set and complete

6. Review roof system, including insulation above deck. Discuss the required application of each to the other components.

- a. Bitumens, felts, use of EVT, all typical application methods and any special techniques required for specified system.
- b. Mechanical or adhesive attachments.
- c. Vapor Retarders
- d. Flashings
- e. Saddles and/or crickets
- f. Venting
- g. Sheet metal

7. Phase Construction Guidelines for project. Factors affecting guidelines include local practices, climate and weather considerations. Tie-offs at days end.

8. Temporary roofing final decisions.

9. Housekeeping, material handling and finished work protection requirements.

10. Inspection and testing requirements - who, frequency, type method of testing, point of application temperature readings, reporting, etc.

11. Project changes in plans, specifications or procedures to be followed - discuss and establish who can approve and how documented.

12. Warranties, guarantees, manufacturer bonds or maintenance agreements (terms, types, who issues, when) for roofing and sheet metal material.

NOTES

AGENDA FOR ROOFING FINAL INSPECTION AND WRAP-UP

PURPOSE: To assure 100% completion of project requirements.

TIMING: Just before the Roofing Contractor concludes his work at the site.

1. Attendance should include those in attendance at the Pre-Application Conference.

2. Complete rooftop walk over and review:

- a. Perimeter edges
- b. Walls
- c. Curbs and other equipment
- d. Drains
- e. Rooftop penetrations
- f. Site cleanup
- g. Sheet metal

3. Final Punch List establishment of items to be completed. Copies to all parties.

4. Summary of project records. Organize for final file. Wrap up any loose ends. Checklist for final documents should include:

- a. Warranties, guarantees, manufacturer bonds, or maintenance agreements
- b. Inspection forms, reports, certificate of final completion
- c. Laboratory final reports (if any required)

5. Recommendation for routine maintenance program to owner.

6. Discuss responsibility for roof system protection until project completed. Responsibility for coordination usually rests with General Contractor. Any damage or additional work to be conducted by original Roofing Contractor in order to keep original guarantee valid.

7. Final acceptance by the owner will not be made without submittal and approval of fully executed guarantees for each type of roof installed, which shall include, but not necessarily be limited to the Roofing Material Manufacturer's Guarantee, Roof Completion Information Form and Contractor's Guarantee on R1, R2 or R3.

NOTES

ROOF COMPLETION INFORMATION

Facility Name _____ Building Name _____
Site I.D.. _____ Building I.D. _____ Project No. _____
Roof Section _____ Replacement _____

Roof Type:		Surfacing Type:		Bitumen Type:		Drainage Type:	
1.	BUR	1.	Gravel	1.	Hot Asphalt	1.	Over the Edge
2.	SBS Mod. Bit.	2.	Smooth Uncoated	2.	Torched Asphalt	2.	Roof Drains
3.	APP Mod. Bit.	3.	Modified Asphalt	3.	Cold Process	3.	Perimeter Gutter
4.	PVC/CPV	4.	Ceramic Granules	4.	Pitch	4.	Internal Gutter
5.	PUF	5.	Silicone	5.	Modified	5.	_____
6.	Metal	6.	Acrylic	6.	None		
7.	Shingle	7.	Urethane	7.	_____	Total Penetrations:	
8.	Tile	8.	Aluminum			_____	
9.	_____	9.	_____				
Slope:		Deck Type:		Insulation:		No. of Piles:	
1.	None	1.	Structural Concrete	1.	Polyurethane Foam	_____	
2.	1/8 in./ft.	2.	Gypsum	2.	Fiberglass	Insulation Thickness:	
3.	1/4 in./ft.	3.	Metal	3.	Perlite	_____	
4.	1/2 in./ft.	4.	Lt. Wt. Concrete	4.	Tapered Perlite	Roof Area (sq. ft.)	
5.	_____	5.	Cement Fiber	5.	Polystyrene	_____	
		6.	Wood	6.	Wood Fiber		
		7.	_____				

Roofing Contractor:

Address: _____

Roofing Contractor's Telephone: _____

Roofing Manufacturer:

Address: _____

Roofing Manufacturer's Telephone: _____

Warranty Beginning Date: _____

Warranty Ending Date: _____

Roof Warranty Number: _____

Beginning Date: _____

Ending Date: _____

ROOFING GUARANTEE R1

OWNER: LOUISIANA STATE UNIVERSITY

ADDRESS: OFFICE OF FACILITY SERVICES
BATON ROUGE, LOUISIANA 70803

WHEREAS _____

Address _____

Telephone (____)_____,
herein called the "Roofing Contractor", has performed roofing and flashing in accordance with the Contract Documents for Project No. _____, (hereinafter called the "Work") under a

Subcontract with _____

General Contractor on the Following Project: _____

Name of Project: _____

User Agency: _____

Location/Address: _____

Name and Type of Building(s): _____

_____ Building I.D. _____

Type(s) of Roof Deck(s): _____

Total Roof Area: _____ SF; Flashing, Edge: _____ LF; Base: _____ LF

Date of Acceptance: _____ Guarantee Period: 2 Years

Date of Expiration: _____

AND WHEREAS the Roofing Contractor has contracted (as a Subcontractor) to guarantee said work against water entry from faulty or defective materials and workmanship for the designated Guarantee period;

AND WHEREAS the General Contractor, by its acceptance of the Contract for the above described project, has jointly assumed with the Roofing Contractor the obligations to the Owner of said guarantee against leaks and faulty or defective materials and workmanship;

NOW THEREFORE the Roofing Contractor and the General Contractor jointly and severally guarantee, subject to the terms and conditions herein set forth, that during the Guarantee Period they will at their own cost and expense, make or cause to be made with approved procedures and materials such repairs to or replacements of said work resulting from water entry or faults or defects of said Work as are necessary to correct faulty and defective work and as are necessary to maintain said Work in watertight conditions and further to respond on or within two (2) working days upon written notification of leaks or defects by the Owner/User Agency. Furthermore, they will at their own cost and expense maintain the roof for (2) years after acceptance, in accordance with the current edition of the Roof Maintenance Manual published by the Roofing Industry Educational Institute. The roof shall be inspected a minimum of twice each year, and a report prepared documenting the conditions observed at each inspection. These inspections shall be made once during the months of April or May and once during the months of September and October. Two copies of each report shall be forwarded to the Owner and User Agency.

This Guarantee is made subject to the following terms and conditions:

1. Specifically excluded from this guarantee are damages to the Work, other parts of the building and building contents caused by: A) lightning, and storm (includes hurricanes and tornadoes), hailstorm, earthquakes and other unusual phenomena of the elements; B) fire; and C) structural failures causing excessive roof deck, edgings and related roof components movement. When the Work has been damaged by any of the foregoing causes, the Guarantee will be null and void until such damage has been repaired by the Roofing Contractor, and until the cost and expense thereof has been paid by the Owner or another responsible party so designated.
2. During the Guarantee Period, if the Owner/User Agency allows alteration of the Work by anyone other than a Contractor approved in writing by the Roofing Subcontractor, General Contractor, and Roofing Material Manufacturer prior to the work being performed, including cutting, patching and maintenance in connection with penetrations, attachment of other work, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the Owner/User Agency engages the Roofing Contractor to perform said alterations, the Guarantee shall not become null and void, unless the Roofing Contractor, prior to proceeding with said work, shall have notified the Owner/User Agency in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the Work, thereby reasonably justifying a termination of this Guarantee.
3. During the Guarantee Period, if the original use of the roof is changed and it becomes used for, but for which it was not originally designed or specified, as a promenade, work deck, spray-cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.
4. During the Guarantee Period, if any building or area of a building is changed to uses creating extremes of interior temperature and/or humidity, but for which it was not originally designed and specified, without provisions and alterations made to the building which effectively contain or control these conditions, this guarantee shall become null and void upon the date of said change.
5. The Owner/User Agency shall promptly notify the Roofing Contractor in writing of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the Roofing Contractor to inspect the Work, and to examine the evidence of such leaks, defects or deterioration.
6. This Guarantee is recognized to be the only guarantee of the General and Roofing Contractor on said work, and shall not operate to restrict or cut off the Owner from other remedies and recourses lawfully available to him in case of roofing failure. Specifically, this Guarantee shall not operate to relieve the Roofing Contractor of his responsibility for performance of the original work, regardless of whether the Contract was a Contract directly with the Owner or a Subcontract with the Owner's General Contractor.

IN WITNESS THEREOF, this instrument has been duly executed this _____
day of _____, 20____.

Roofing Contractor's Signature: _____

Typed Name: _____

Representing: _____

Telephone Number: _____

And has been countersigned by the General Contractor issuing the Roofing Contractor's Subcontract for said work:

Name of General Contractor: _____

Date: _____ Authorized Signature: _____

Representing: _____

Typed Name: _____

Telephone Number: _____

WITNESS: _____

Telephone Number: _____

Witness: _____

Section 07 55 20

SBS Modified Bitumen Membrane Roofing

Specifications

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PART I - GENERAL

1.01 DESCRIPTION

A. Work includes:

1. Installation of two-ply reinforced S.B.S. modified membrane roof system over metal deck roof area, consisting of one layer of polyisocyanurate insulation followed by one (1) layer of primed fiberglass mat-faced gypsum roof cover board followed by torch heat welding SBS modified base ply and torch heat welding granulated SBS modified top membrane (cap sheet). Installation shall be complete with related flashings, scuppers, cant strips, and performing such incidental or other work as may be necessitated by these operations.
2. Applicator is solely responsible for accuracy of all measurements and estimates of material, quantities, and sizes.
3. IMPORTANT NOTE: Prior to the Pre-Construction Conference, the Contractor shall provide to the Architect the following:
 - a. Letter from the roofing manufacturer stating that bidder (roofing installer) is an acceptable contractor authorized to install the proposed system.
 - b. Letter from the primary roofing manufacturer stating that the proposed application will comply with the manufacturer's requirements in order to qualify the project roof for the specified guarantee.

B. Related Sections:

1. Steel Deck:	Section 05 10 00
2. Rough Carpentry:	Section 06 10 00
3. Warranty	Section 01 70 00

1.02 REFERENCE STANDARDS

- A. ANSI/ASTM D41 - Asphalt Primer Used in Roofing, Damproofing, and Waterproofing.
- B. Factory Mutual Engineering Corp.: Class I, Wind Rating, 1A-90 Approval, as determined in accordance with FMRC Standard 4470.
- C. National Roofing Contractors Association (NRCA) – Roofing and Waterproofing Manual.
- D. ASTM C-1289 - Insulation Board, Thermal, Polyisocyanurate Foam Faced with Asphalt/Glass Mat, or Polymer Glass Mat on Both Sides of Foam.
- E. ASTM D-6163 - Type I, Fiber glass reinforced SBS modified bitumen roofing membrane. Grade S for base sheet and Grade G for cap sheet.
- F. ASTM D-4586 - Asphalt Cement - asbestos free.
- G. ASTM D-5147 - Sampling and Testing Modified Bituminous Sheet Material
- H. Underwriters Laboratories - U.L. Class A Fire Rating for entire roof system. System shall be listed in the current U.L. Building Materials Directory.
- I. Insulation Fasteners shall be tested and approved by Factory Mutual in accordance with their Standard 4470.
- J. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
- K. CGSB 37GP56M Classification: Type 2, Class C, Grade 1.
- L. Underwriters Laboratories (UL) – Fire Hazard Classifications.
- M. ASTM C1177 Standard specification for Glass Mat Gypsum Substrate.
- N. Conform to applicable Federal, State, and Local Building Codes.

1.03 QUALITY ASSURANCE

- A. Installer must be an approved and certified installer by the roofing manufacturer for the approved roof to be installed.
- B. Provide a factory trained technician for inspections of roofing system prior to and during installation.
- C. Provide hand-held infrared thermometer for taking readings at point of application; record results.
- D. All materials shall be certified as TOTALLY ASBESTOS-FREE.
- E. The fastener manufacturer, roofing manufacturer, and all parties mentioned are required to attend meetings for pull tests. Formal meetings are to be requested and scheduled with all parties (7) days in advance.

1.04 PRE-ROOFING CONFERENCE

- A. Hold roofing pre-construction conference at the project site after approval of submittal data, and at least seven (7) days prior to the start of roofing work.
- B. Required attendees shall not be less than the EBRPSS Program Manager, the Architect, the General Contractor's Superintendent, the Roofing Subcontractor Foreman, the Roof system

Section 07 55 20

SBS Modified Bitumen Membrane Roofing

Specifications

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Manufacturer's Technical Representative, and the Foreman of any other Subcontractor performing work on, or providing equipment requiring coordination with roof

C. Topics to be reviewed:

1. Review in detail Architect's specifications, roof plans and roof/flashing details.
2. If a manufacturer's specification is used, review, and resolve all deviations or differences from the Architect's specifications.
3. Review and understand Factory Mutual/Underwriters Laboratories requirements and resolve all conflicts between FM/UL and Architect's/manufacturer's specifications.
4. Review roof plans; for slope, deck type, drainage, membrane attachment, expansion joints, flashing and details. Resolve all conflicts between what is considered good roofing practice and the specifications.
5. Review roofing system and recommended work practices for its installation.
6. Study plans to determine whether all roof areas have different requirements.
7. Designate which areas on site will be available to use as storage/working areas.
8. Review procedures to be followed to provide proper protection of roof system during and after construction of roof.
9. Observe and make notes of job conditions prior to installation.

1.06 SUBMITTALS

- A. Manufacturer's product data sheets and recommended methods of installation to demonstrate compliance with specified requirements.
- B. Manufacturer's written confirmation that the specified system is eligible for the specified manufacturer's guarantee when installed by the roofing contractor.
- C. Manufacturer's written agreement to issue specified guarantee on the specified roof system when installed by successful bidding roofing contractor.
- D. Sample of WBRPSS-approved warranty from manufacturer.
- E. Submit 12-inch square samples of base ply and cap sheet (color specified) to be installed.

1.07 DELIVERY, STORAGE & HANDLING

- A. Store materials in a cool, dry place.
- B. Store roll material on end, with selvage edges up, on clean, dry, raised surface.
- C. Place insulation on raised surface and protect with waterproof tarpaulins, with sufficient air circulation to prevent condensation.
- D. Do not install wet insulation.
- E. Store solvents, emulsions, and coatings in a cool, dry area between 45 and 100 degrees
- F. Handle roll materials to prevent damaged ends.
- G. Store all materials in their unopened original packaging, bearing the manufacturer's name, related standards and any other specification or reference accepted as standard. Allow no unlabeled materials on site.

1.08 PROJECT CONDITIONS

- A. Do not start roofing if rain is imminent, or ambient temperature is below 45 degrees F.
- B. If rain occurs during roof membrane application, cease operations and protect deck, insulation, penetrations and membrane from water damage and intrusion.
- C. Remove and replace all material that has been subject to moisture.
- D. Protect finished surfaces of building from damage by installation of roofing system.
- E. Protect completed roofing and flashings from damage by subsequent roofing installation and construction traffic.
- F. In event of damage, immediately make repairs and replacements required by Architect.
- G. Comply with all applicable code, fire and safety regulations.
- H. Flame-heated Equipment
 1. Locate and use flame-heated equipment so as not to endanger the structure or other materials on the site or adjacent property.
 2. Provide and maintain fire extinguisher.

1.09 SUBSTITUTION

- A. When particular make or tradename is specified, it shall indicate the standard required. Bidders proposing substitutes shall submit following ten days prior to bid date to Architect.
 1. Written request with explanation of why it should be considered.
 2. Manufacturer's literature and samples of requested substitutions.

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3. Three (3) job references available for inspections within fifty (50) miles of Architect where substitutes were used under similar conditions.
- B. Only substitutes approved in writing by Architect prior to bid date will be considered.

1.10 WARRANTY

- A. Roof System (includes roofing, insulation, related flashings, and incidental roof system construction components): Manufacturer's 20-year, NO DOLLAR LIMIT, to cover materials and labor to repair any leaks and/or failures occurring within the warranty period. It is the intent that all the roofing accessories be manufactured and/or fabricated in a manner such that the roofing warranty will provide coverage for the roofing accessories.
- B. Roofing, Flashing, & Copings: Contractor's 2-year material & labor warranty to repair any leaks (and other damage caused by these leaks) within the warranty period. All roof flashings and copings (including metal) are to be included in manufacturer's guarantee.
- C. Warranty period shall start only at the agreed date of substantial completion of the entire project.
- D. An 11 and 23 month walk through will be required prior to the end of the warranty period. All roofing components will be checked for water tightness, open seams, premature wear, loose fasteners, blisters and water stain patterns.
- E. The warranty shall be governed by and shall be construed and enforced in accordance with the internal laws of Louisiana.
- F. Manufacturer warranty shall include rider(s) if required to provide coverage of the roofing for wind speeds matching the design criteria of the roof assembly and shall include coverage of the roofing system as a whole including insulation, edge metal, flashings and other incidental components of the roof as indicated in the drawings and specifications.
- G. Special in-service conditions that the roof membrane must endure, including chemicals, grease, oil, and other contaminants. Review conditions at kitchen exhaust and roof top HVAC units for discharge pollutants. Design solution must address all known environmental conditions.
- H. Manufacturer warranty shall include rider(s) for loss of water tightness of the roof assembly resulting from damage caused by chemical attack emitted by substances normally associated with food preparation or HVAC roof top equipment and exhaust vents for a radius not exceeding a six (6) feet by six (6) feet area surrounding the covered roof top equipment unit point of emission. The Manufacturer must specify any additional material to be installed for the added chemical protection of the roofing system and be included in the submittal.
- I. Refer to Owner's Front End Documents: Special Extended Warranty, for use in compliance with the specifications for the installer Roofing Warranty.
- J. Any disputes regarding Roofing Systems Warranty shall be resolved as provided by local mediation, and/or as provided by the General Conditions of the Contract for Construction.

PART 2 - PRODUCTS

2.01 INSULATION

- A. Manufacturers:
 1. Soprema
 2. Johns Manville
 3. Substitutions – Section 01 63 00.
- B. Characteristics:
 1. Rigid closed cell polyisocyanurate-foam board insulation.
 2. Thickness: 4" thick, one layer.
 3. Combined aged R-Value of all Polyisocyanurate layers: 24
 4. Density, ASTM D 1622, (nominal 2 pcf)
 5. Compressive Strength, ASTM D 1621, (min. 20 lbs./inch²)
 6. Water Vapor Transmission, ASTM E 96, (< 1.0 perm)
 7. Dimensional Stability, ASTM D 2126, (< 2%, 7 days)
 8. Thermal Resistance, ASTM C 518/PIMA CP 101 (Report)
 9. Flame Spread, ASTM E 84, (25)
 10. Spread of Flame, ASTM E 108 (Class A or B with roof)
 11. Water Absorption, ASTM C 209 (< 1%)

2.02 COVER BOARD

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Specifications

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- A. Manufacturers:
 - 1. Soprema Sopraboard,
 - 2. Georgia Pacific, primed fiberglass mat-faced gypsum roof cover board.
 - 2. Johns Manville Densdeck Prime
 - 3. Substitutions – Section 01 63 00; shall be equivalent to specified.
 - B. Characteristics:
 - 1. Size: 4 feet x 8 feet x 1/4 inch thick.
 - 2. Weight: 1.95 psf
 - 3. Surfacing: Fiberglass mat.
 - 4. Flexural Strength: Parallel (ASTM C473): 80 lbf minimum.
 - 5. Flute Span: (ASTM E661): 5 inches.
 - 6. Permeance (ASTM E96): not more than 35 perms.
 - 7. R-value: (ASTM C518): not less than 0.56
 - 8. Water Absorption (ASTM C1177): less than 10% of weight.
 - 9. Compressive Strength (applicable sections of ASTM C472): 500 to 900 PSI.
 - 10. Surface Water Absorption: (ASTM C473): Not more than 2.5 grams
- 2.03 SBS MODIFIED BITUMEN ROOFING SYSTEM
- A. MANUFACTURERS:
 - 1. Soprema
 - 2. Johns Manville Roofing System
 - 3. Siplast
 - 4. Substitutions: Section 01 63 00
 - B. BASE PLY
 - 1. Equal to Soprema Elastophene Flam
 - 2. Description:
 - a. Field base membrane ply shall have a glass mat reinforcement and thermofusible elastomeric asphalt. Both sides shall have a thermofusible plastic film. This membrane is to be applied by torch heat welding only.
 - b. Components: Reinforcement shall be 1.4 lbs./sq non-woven fiberglass. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
 - C. MEMBRANE TOP PLY (CAP SHEET)
 - 1. Equal to Soprema Elastophene Flam Granules FR
 - 2. Description:
 - a. Field cap membrane ply shall have a glass mat reinforcement and thermofusible elastomeric asphalt with fire retardant agents added. The top side shall be self-protected with colored granules. The underside shall be protected by a thermofusible plastic film. Membrane is to be applied by torch heat welding only.
 - b. Color: white.
 - c. Components: Reinforcement shall be 1.4 lbs./ sq. non-woven fiberglass. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
 - D. BASE PLY FLASHING
 - 1. Equal to Soprema Sopralene Flam 180.
 - 2. Description:
 - a. First membrane flashing ply shall have a non-woven polyester reinforcement and thermofusible elastomeric asphalt. Both sides shall have a thermofusible plastic film. This membrane is to be applied by torch heat welding only.
 - b. Components: Reinforcement shall be 3.68 lbs./ sq. non-woven polyester. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.
 - E. TOP PLY FLASHING
 - 1. Equal to Sopralene Flam 180 GR
 - 2. Description: Cap membrane flashing ply shall have a non-woven polyester reinforcement and thermofusible elastomeric asphalt with fire retardant agents added. The top side shall be self-protected with colored granules. The underside shall be protected by a thermofusible plastic film. This membrane is to be applied by torch heat welding only.
 - 3. Color: white.
 - 4. Components: Reinforcement shall be 3.68 lbs./sq. non-woven polyester. Elastomeric asphalt shall be a mix of selected bitumen and SBS thermoplastic polymer.

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Specifications

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- F. ASPHALT PRIMER
 1. Equal to Soprema Elastocol 350.
 2. Primer shall be applied on all dissimilar materials.
 3. Description : Black bituminous varnish.
 4. Composition : Asphalt modified bitumen with thermoplastic polymers and volatile solvents.
- G. MISCELLANEOUS
 1. Walkway Pad: Equal to Soprema SOPRAWALK
 2. Water Cut-Off Mastic: Equal to Soprema SOPRACOLLE or SOPRAMASTIC
 3. Gusset Material: Equal to SOPRALENE FLAM 180.
 4. No pitch pockets are allowed. Provide liquid flashing at penetrations; ALSAN RS or equal.
 5. All other materials not specifically described (including granules), but required for a complete and proper installation of roofing, shall be selected by approved manufacturer and subject to approval of Architect/Owner.
 6. Roof Vents: provide if required by roof system manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Conduct pre-insulation roofing conference and progress site visit with roof manufacturer field inspectors as per 3.13 of this section.
- B. Surface Preparation:
 1. Inspect metal deck closely for:
 - a. Proper securement of panels to joists with no loose decking.
 - b. Side lap fasteners in place
 - c. Damaged panels
 - d. CorrosionUnacceptable panels should be brought to the attention of the General Contractor and Project Architect prior to installation of roofing system.
 2. Insure that wood blocking has been installed as detailed in the plans and specifications.
 3. Surfaces on which the roofing membrane system is to be applied shall be dry, clean, smooth, free of fins, sharp edges, loose and foreign materials, oil and grease.
 4. Verify that the work of other trades has been properly completed.
 5. Make sure that all counterflashing receivers, curbs, etc., are constructed in such a manner as to provide a minimum 8-inch base flashing height measured from the finished roof's surface to the top of the base flashing membrane.
 6. Do not install materials in conditions of inclement weather.
 7. Prime all surfaces to which asphalt or membrane will come in contact. Apply at a rate of 150-200 sf/gallon. Coat all metal flashings and fascia with primer which will come in contact with membrane.

3.02 INSULATION & COVER BOARD INSTALLATION

- A. Starting at the low edge of the roof, install rigid insulation and cover board simultaneously using approved mechanical fasteners and plates, at the prescribed rate to achieve the FM I-90 Uplift resistance. Use additional fasteners at perimeters and corners as prescribed in the Factory Mutual 1-28 publication. Fasteners shall be no closer than 6-inches to the board edge. Fasteners must be sized to engage only the top flange of the deck and penetrate no less than $\frac{3}{4}$ inch.
- B. Install boards with long joints continuous and running in a direction parallel to the decking. Short joints should be staggered. Joints should be butted tightly.
- C. Apply only as much insulation to the roof as can be covered the same day with base ply membrane. When there is threat of precipitation, seal exposed edges of insulation at the close of each day's work.
- D. Insulation and cover board shall be installed to meet current International Building Code and NFPA.
- E. Form crickets and saddles by solidly adhering tapered insulation panels over top layer of insulation using full 33 lb. per square moppings of steep asphalt as necessary to provide positive drainage at all portions of the roof area. Board edges shall be butted tightly with no gaps of a $\frac{1}{4}$ inch or larger between them. Mechanically fasten cover board on crickets and saddles., penetrating through to metal deck. Gaps of such size must be filled to top surface level with scrap insulation. If it is found after membrane installation that additional crickets or tapered are required, cut out the underlying membrane and prime the surface of the insulation prior to installation of the new crickets.

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SBS Modified Bitumen Membrane Roofing

Specifications

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3.03 BASE PLY INSTALLATION

- A. Unroll dry base ply membrane on roof for alignment. Each strip shall have 3 inch side laps and six (6) inch end laps.
- B. Begin at low point of roof.
- C. Place membrane so side lap will be centered on drain.
- D. Begin by unrolling the base membrane to its complete length. Once relaxed for a minimum of ten minutes, reroll base ply (halfway) one end at a time in accordance with recommendations of manufacturer, torch onto an approved substrate using a pulling motion combined with balanced side to side torching technique creating an even and continuous melt.
- E. Application shall provide a smooth surface, free of air pockets, wrinkles, fish mouths or tears.
- F. Seal all laps by running a hot trowel along the edge of the seam.
- G. Run membrane tight up against any vertical surfaces such as curbs, parapets, and vents.
All reinforcing membrane and first flashing membrane ply must be completed before the field base membrane application may be complete.
- H. Install per manufacturer's approved details, general requirements and roofers guide.

3.04 BASE FLASHING PLY INSTALLATION

- A. Prior to application, the vertical surface receiving the base flashing ply shall receive a coat of primer at the rate of 150-200 sq. ft./gallon. This primer coating must be tacky before application of the base flashing.
- B. Lay base flashing ply in strips three (3) feet wide to the vertical surfaces, extending onto the flat surface of the roof a minimum of four (4) inches. Side laps shall be three (3) inches and shall be staggered a minimum of four (4) inches with the laps of the base ply.
- C. Heat weld base ply flashing directly on its support from bottom to top followed by the heat welding of the roof tie-in.
- D. After installation of base ply flashing, check all lap seams on the flashing by running a heated trowel along the edge of the seams.
 - 1. Reinforce all inside and outside corners per manufacturer's recommendations.
 - 2. THOROUGHLY SEAL ALL VOIDS IN THE CORNERS AND SEAMS.

3.05 TOP PLY MEMBRANE (CAP SHEET) INSTALLATION

- A. Once the field base ply has been completed and does not show any defects, install the top ply.
- B. Unroll top ply starting from the low point of the roof. Care must be taken to insure good alignment of the first roll (parallel with the edge of the roof). A 45 degree cut shall be made on the selvage edge of underlying membrane prior to application to insure a good seal between the membrane.
 - 1. On first field cap membrane installed at internal drain low point, embed granules on finished edge to create selvage edge (3" lap) at both longitudinal sides. Six (6) inches at end laps.
- C. Torch weld top ply in accordance with recommendations of manufacturer, onto base ply membrane.
 - 1. During this application, simultaneously melt both surfaces forming an asphalt bead that pushes out in front of the top sheet.
- D. Do not to burn the membrane and their respective reinforcements.
- E. Stagger base ply and top ply seams a minimum of twelve (12) inches.
- F. Top ply shall have side laps of three (3) inches and end laps of six (6) inches. Prior to installation of following ply, embed surface granules on laps by torch heating the membrane surface and pressing the granules into the melted asphalt with a hot trowel.
- G. Ensure the two membranes are perfectly welded, without air pockets, wrinkles, fishmouths or tears.
- H. After installation of the top ply, check all lap seams on the top ply using the edge of a hot trowel. Correct any defect.
- I. During installation, avoid asphalt seepage greater than 1/4 inch at seams.
 - 1. Cover any asphalt seepage with a sprinkling of loose granules, color to match membrane.

3.06 TOP PLY FLASHING INSTALLATION

- A. Lay top ply flashing in strips three (3) feet wide.
 - 1. Side laps shall be three (3) inches and shall be staggered a minimum of four (4) inches from top ply laps in order to avoid excessive thickness.
- B. Using a chalk line, layout a straight line on the top ply surface, parallel to the roof edge, six (6) inches inside the roof from the base of the cant strip or right angle to be flashed.
- C. Using a torch and heated trowel, embed the surface granules into the heated and soft bitumen from the chalk line to the edge of the field cap membrane ply, and to the top of the cant or right angle.

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- D. Extend cap membrane flashing ply down the vertical surface onto the field at the roof six (6) inches minimum, sealing over the area embedded granules of the field cap membrane ply. For ease of application, cut roll into required lengths and use width of roll three (3) feet down length of roof, maintaining specified three (3) inch laps.
 - 1. Heat weld top ply flashing in accordance with recommendations of Soprema, directly on its base ply, proceeding from bottom to top followed by the torching of the roof tie-in.
 - 2. Firmly press flashing into position using a damp sponge.
 - E. Thoroughly seal all voids in the corners and seams.
 - F. Application shall provide a smooth surface, free of air pockets, wrinkles, fishmouths or tears.
 - G. During installation, avoid asphalt seepage greater than ¼ inch at seams.
 - 1. Cover any asphalt seepage with sprinkling of loose granules; color to match membrane.
- 3.07 WATER CUT-OFF
- A. At the end of the day's work, and when precipitation is eminent, a water cut-off shall be constructed at all open edges. Construct the cut-off with the same membrane and asphalt as that used for the roofing system. Cut-off must be able to withstand extended periods of wet weather. The water cut-off shall be completely removed prior to resuming the installation of the roofing system.
- 3.08 PIPE PENETRATIONS
- A. Brace pipes high and low to structure to prevent movement. Insulate from underside of deck, along laterals, then minimum 6" vertical below next elbow joint (or tangent) to reduce potential condensate drippage.
 - B. Inspect base ply installation and ensure tight seal around pipe.
 - C. Construct and install over base ply a sheet metal vent or lead sleeve (as appropriate) with welded or soldered seams and flange per details.
 - 1. Provide a minimum 5-inch base flange.
 - 2. Prime all metal surfaces.
 - 3. Heat metal flange or base membrane with torch prior to setting in place and firmly press on flange to ensure complete and even contact with roof surface.
 - D. Torch into place a reinforcing sheet of base ply material three feet square over the vent.
 - 1. Seal all seams and edges with a heated trowel.
 - E. Install top ply as specified under 3.07 of this section.
 - 1. Cut membrane to fit tight against stack sleeve and seal by running a heated trowel around vent base.
 - F. Install metal vent cap.
- 3.09 WALKWAYS
- A. Install 6' x 6' pad at high and low step-offs at each roof scuttle.
 - B. Layout sheets dry, adjusting spacing to be uniform, cut and trim pieces as required to fit conditions, direction changes and closing.
 - C. Align the sheets to be straight and true, using a straight edge or snap lines as required.
 - D. Prime all affected areas with asphalt primer.
 - E. Follow specifications for torching top ply installation. (No granule embedment necessary.)
- 3.10 CORNER FLASHING
- A. Install Gussets per manufacturer's requirements.
- 3.11 COPING / PARAPETS
- A. Verify all surfaces are properly secured and fully primed, ready to receive flashings.
 - B. Base ply membrane is to run horizontally tight up to the vertical or cant as required.
 - C. Install base ply flashing according to 3.06 of this section.
 - D. Torch weld top ply and flashing as detailed and specified in 3.07, 3.08 this section.
- 3.12 PROTECTION OF PROPERTY
- A. Protective Coverings:
 - 1. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs, structures, vehicles, utilities, and other items.
 - 2. Lap protective coverings at least 6 inches, secure against wind, and vent to prevent collection of moisture on covered surfaces.
 - 3. Keep protective coverings in place for duration of roofing work.

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- B. Special Protection: Provide approved special protection and avoid heavy traffic on completed work.
 - C. Damaged Work, Materials: Restore work, materials damaged during handling of bitumen and installation of roofing materials to original condition or replace with new materials.
- 3.13 INSPECTION:
- A. Have an **authorized representative of the manufacturer supplying roofing system** perform in-progress inspections and provide written inspection reports distributed to not less than the EBRPSS Program Manager, the Architect, the General Contractor, and the Roofing Subcontractor. Notify the EBRPSS Program Manager, Architect and Roofing Foreman a minimum of 48 hours in advance for inspections at the following benchmarks:
 - 1. Completion of installation of new deck.
 - 2. Completion of installation of rigid insulation and cover board.
 - 3. Prior to installation of cap sheet.
 - 4. The inspections will occur more often for larger projects due to phasing.
 - B. Final Inspection after job completion shall be made by all present at Pre-Roof Conference.
- 3.14 TESTING:
- A. The Owner reserves the right to make independent tests of the in-place roofing. If tests prove satisfactory, all costs shall be borne by the Owner. If tests prove unsatisfactory, all costs for testing activities and remedial work to satisfy contract criteria, and retesting activities shall be borne by the General Contractor.
- 3.15 WARRANTY WALKTHROUGH
- A. Two warranty walkthroughs of the roof and all roofing components are to be performed eleven months and twenty three (23) months after the Date of Substantial Completion.
 - B. All roofing components will be checked for water tightness, open seams, premature wear, loose fasteners, blisters, and water stain patterns at the eleven (11) and twenty three (23) month warranty walkthroughs.

END OF SECTION

**SECTION 07 62 00
SHEET METAL FLASHING, GUTTERS, DOWNSPOUTS AND TRIM
(ROOF RELATED SHEET METAL)**

CONDITIONS OF THE CONTRACT AND DIVISION 1, as applicable to this Section.

PART I - GENERAL

1.1 SECTION INCLUDES

- A. It is the intent of this Section that the Work shall:
 - 1. conform to all applicable building code requirements and of authorities having jurisdiction;
 - 2. include all shop and field formed sheet metal work shown on drawings, specified or required, including, but not limited to:
 - a. Roof penetration sleeves and hood and umbrella counter flashing
 - b. Metal counter flashing
 - c. Expansion joint
 - d. Roof drains
 - e. Scuppers
 - f. Metal perimeter edge
 - g. Gutters, Downspouts, Splash Blocks and Splash Pans
 - h. One-way roof moisture relief vents
 - i. Metal gravity vents
 - j. Metal heat exhaust vents
 - k. Sanitary vent pipes
 - l. Pipe box
 - m. Copings, trim and miscellaneous sheet metal accessories.
 - 3. be part of the Work of Section 07 41 13, Pre-finished Metal Roofing; and
 - 4. be performed by a single source contractor.

1.2 RELATED WORK

- A. Section 07 41 13 – Pre-finished Metal Roofing
- B. Section 07 72 00 - Roof Accessories
- C. All Sections of Work relating to or affecting the roofing system, including mechanical, plumbing and electrical items.

1.3 REFERENCES

- A. ASTM International (ASTM)
 - 1. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
 - 2. A526, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
 - 3. A527, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
 - 4. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 5. B32, Standard Specification for Solder Metal
 - 6. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

- B. FM Global (FM)
 - 1. Loss Prevention Data Sheets: I-49, Perimeter Flashing
- C. Federal Specifications (FS)
 - 1. QQ-L-201
- D. National Association of Architectural Metal Manufacturers
(NAAMM)
- E. National Roofing Contractors Association (NRCA)
 - 1. Roofing and Waterproofing Manual
- F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
 - 1. Architectural Sheet Metal Manual

1.4 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's specifications and other data needed to prove compliance with specified requirements.
 - 2. Manufacturer's installation instructions.
- B. Shop Drawings: Indicating sizes, configurations, details of attachment to related and adjacent work, materials, and finishes.
- C. Samples:
 - 1. Full range of finish colors for Project Manager's selection.
 - 2. 12 inch long sample of each specified item with approved finish.
 - 3. Provide full size mockup of all shop built assemblies.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Fabricator and installer of roof-related flashing and accessories shall be the same as the membrane roof installer.
- B. Comply with governing codes and regulations of authorities having jurisdiction.

1.6 INSTALLATION CONFERENCE

- A. Refer to Section 01 31 13 – Project Coordination.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, handle and store materials in accordance with manufacturer's instructions.
- B. Handle and store materials and equipment in such a manner as to avoid damage.
- C. No storage of materials shall be permitted on roof areas other than those materials that are to be installed the same day. Any exception must be in written form. Do not place materials or equipment in such a manner as to overload structure.

1.8 WARRANTIES

- A. Manufacturer's Product Warranty:
 - 1. Manufacturer's standard 20 year Kynar 500 or Hylar 5000 Finish warranty signed by the manufacturer, with guarantee covering any failure of the fluoropolymer finish during the warranty period.
 - 2. Failure is defined to include, but not be limited to:
 - a. Deterioration of finish, such as fading, discoloring, peeling, cracking, corroding, etc.
 - 3. Correction may include repair or replacement of failed product.

- B. Roofing Contractor's Warranty:
 - 1. Contractor shall warrant the sheet metal work and related work to be free from defects in workmanship and materials, and that the metal flashings will be and remain watertight, for a period of five (5) years from date of Substantial Completion.
 - 2. Defects shall include, but not be limited to:
 - a. Leaking water or bitumen within building or construction.
 - b. Becoming loose from substrate.
 - c. Loose or missing parts.
 - d. Finish failure as defined above.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Manufacturers named within CONTRACT are approved for use on the Project providing:
 - 1. their products meet or exceed the CONTRACT;
 - 2. company has a minimum of five (5) years experience manufacturing products of the type specified;
 - 3. products have been tested in conjunction with roofing membrane system as an assembly and as such has obtained the same approval and rating as the roofing membrane system; and
 - 4. products are approved for use by the roofing membrane manufacturer.

- B. Substitutions shall be in accordance with Division 1 requirements regarding substitutions.

2.2 SHEET METAL MATERIALS

- A. General Requirements: Roofing sheet metal system shall have been tested in conjunction with roofing membrane system as an assembly and have the same approval and rating as the roofing membrane system.

- B. Prefinished Galvalume Sheet Steel:
 - 1. Commercial quality with 0.20 percent copper, conforming to ASTM A526, except ASTM A527 for lock forming, with G-90 hot-dip galvanized coating designation.
 - 2. Thickness: Except as otherwise indicated, minimum 24 gauge. SMACNA recommendations shall govern.
 - 3. Finish: Kynar 500 or Hylar 5000 in color as selected by Project Manager from manufacturer's standard colors to match standing seam roof color.

- C. Stainless Steel: ASTM A167, Type 302/304 Soft Temper, No. 2D finish. Minimum thickness 24 gauge, except as otherwise noted.

2.3 FASTENERS

- A. Same metal as flashing/sheet metal or other non-corrosive metal or as noted below.
- B. **All fasteners installed into pressure treated lumber shall be stainless steel – regardless of whether or not specifically indicated as such.**
- C. **Exposed fasteners shall have 1-piece long-life heads, and be self-sealing and gasketed for weathertight installation. (ZAC type).**
- D. Match finish 1 color of exposed heads with material being fastened.
- E. Mechanical Fasteners:
 - 1. Nails: Stainless Steel ring shank, minimum 1-1/2 inches in length with 1/2 inch diameter head.
 - 2. Washers: Steel washers with bonded rubber sealing gasket.
 - 3. Screws: Self-tapping sheet metal type of stainless steel or compatible with material being fastened, with integral EPDM washers, as noted above.
 - 4. Rivets: Stainless steel or cadmium plated material, closed end type of sizes recommended by sheet metal manufacturer to suit application.
- F. Clips:
 - 1. Continuous Cleat (coping/fascia): Minimum 16 gauge, G-90 galvanized finish or stainless steel.

2.4 RELATED MATERIALS

- A. Solder: ASTM B32, alloy grade 58, 50 percent tin, 50 percent lead.
- B. Flux:
 - 1. Phosphoric acid type, manufacturer's standard.
 - a. For Use with Steel or Copper: Rosin flux
 - b. For Use with Stainless Steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.
- C. Underlayment:
 - 1. 60 mil minimum, bitumenous self-adhering roof underlayment below all metal roof areas, as required by roofing manufacturer for weathertightness warranty.
 - 2. Where flexible flashings are required, utilize 48 mil minimum, non-reinforced, homogeneous, waterproof, impermeable elastomeric sheeting manufactured by Nervastral, Inc. or Lexsuco.
- D. Adhesives: Type recommended by flashing sheet manufacturer seaming and adhesive application of flashing sheet to ensure adhesion and watertightness.
- E. Metal Accessories: Sheet metal clips, straps, anchoring devices, clamps and similar accessories required for the complete installation of work, matching or compatible with material being installed, non-corrosive, size and gauge recommended by installer to suit application and performance.
- F. Sealant:
 - 1. Type A:
 - a. Type: One-part, non-sag, moisture-curing polyurethane sealant.

- b. Approved Products/Manufacturers: “Chem-Calk 900” manufactured by Bostik Construction Products Division, “Vulkem 921” manufactured by Mameco International, Inc., “Dynatrol I” manufactured by Pecora Corporation, “NP 1” manufactured by Sonneborn Building Products, or approved equal.
 - 2. Type B:
 - a. Type: One-part, neutral-curing, medium-modulus silicone sealant for sealing metal to metal surfaces, i.e. metal edge, cover plates, etc.
 - b. Approved Products/Manufacturers: “Chem-Calk 1200” manufactured by Bostik Construction Products Division, “795 Silicone Building Sealant” manufactured by Dow Corning Corporation, “895 Silicone” manufactured by Pecora Corporation, “Omniseal” manufactured by Sonneborn Building Products, “Spectrem 2” manufactured by Tremco Incorporated, or approved equal.
 - 3. Type C:
 - a. Type: One-part, non-skinning butyl sealant for sealing exposed or semi-exposed metal-to-metal laps, cover plates, etc.
 - b. Approved Products Manufacturer’s: Products as recommended by the roofing manufacturer for the specific application.
- G. Grout - Pitch Pans:
 - 1. Type: Quick-setting, non-shrink, non-metallic, high strength formula complying with ASTM C1107.
 - 2. Approved Products/Manufacturers: “Sure Grip High Performance Grout” manufactured by Dayton Superior Corporation, “Premier Quick-Trim” manufactured by L & M Construction Chemicals, Inc., “Masterflow” manufactured by Master Builders, Inc., “SonnogROUT 10K” manufactured by Sonneborn Building Products, or approved equal.
- H. Pitch Pan Filler:
 - 1. Type: Pourable polyurethane sealer, approved by roofing system manufacturer.
 - 2. Approved Products/Manufacturers: “Quick Pitch Sealer” manufactured by U.S. Intec, “SPM Pourable Sealer” manufactured by Johns Manville, or approved equal.
- I. Termination Bar:
 - 1. Material: Extruded aluminum bar with flat profile.
 - 2. Size: 1/8 inch thick by one (1) inch wide with factory punched 1/4 inch x 3/8 inch oval holes spaced six (6) inches on center.
 - 3. Approved Product/Manufacturer: “TB 125” manufactured by TruFast Corp., or approved equal.
- J. Pipe Hangers and Supports: Refer to Section 07721, Roof Accessories.
- K. Splash Blocks: Concrete type, of size and profiles indicated; minimum 3,000 psi compressive strength at 28 days, with minimum five (5) percent air entrainment. Use at locations where roof drainage dumps on ground.
- L. Splash Pans: 22 gauge stainless steel, of size and profiles indicated. Use at locations where roof drainage discharges over adjoining, lower roof level(s).

2.5 FABRICATION

- A. Except as otherwise indicated, fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed shop

drawings. Form all flashings, receivers and counterflashings in accordance with standards set forth in the NRCA roofing manual and SMACNA.

- B. Comply with manufacturer's installation instructions and recommendations.
- C. Unless noted otherwise, fabricate perimeter edge/fascia, scuppers, gutters, downspouts, copings, and trim from pre-finished aluminum sheet.
- D. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edges, counterflashing, and coping caps.
- E. Fabricate items to size and dimensions as indicated on the drawings. Limit single-piece lengths to ten (10) feet.
- F. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work sufficient to permanently prevent leakage, damage or deterioration of the work.
- G. Integrate flashing in a manner consistent with detailing. Form work to fit substrates.
- H. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.
- I. Fabricate items with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.
- J. Fold back edges on concealed side of exposed edge to form hem.
- K. Unless noted otherwise, lap joints minimum one (1) inch. Rivet and solder joints on parts that are to be permanently and rigidly assembled.
- L. Seams:
 - 1. Wherever possible, fabricate non-moving seams in sheet metal with flat-lock seams and end joints.
 - 2. Pre-finished Steel Metal: Seal pre-finished metal seams with rivets and silicone sealant.
 - 3. Metal Other than Aluminum: Tin edges to be seamed, form seams, and solder.
- M. On Kynar 500 or Hylar 5000 pre-finished metal, surface sand metal flanges prior to applying any primers. Prime all metal in contact with bituminous material.
- N. Backpaint all concealed metal surfaces with bituminous paint where expected to be in contact with cementitious materials or dissimilar metals.
- O. Expansion Provisions: Where lapped or bayonet type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than one (1) inch deep filled with mastic sealant concealed within joints.

2.6 FABRICATED ITEMS

- A. Metal Flashings: (Minimum ten (10') foot lengths)
 - 1. Through wall Receiver Tray: Minimum 24 gauge stainless steel.
 - 2. Counterflashing: Minimum 22 gauge pre-finished galvanized metal.

- B. Wind Clips: Minimum 22 gauge to match material of counterflashing, one (1) inch wide by length to engage counterflashing a minimum of 1/2 inch. To be installed at all wall flashings and at curb flashing lengths longer than 5 feet.
- C. Roof Penetrations:
 - 1. Umbrella Counterflashing: Two-piece construction of minimum 24 gauge stainless steel, fabricated in accordance with drawings or project requirements.
 - 2. Pitch Pans:
 - a. 24 gauge stainless steel.
 - b. Fabricate to provide installed minimum clear inside perimeter dimension of two (2) inches on each side of penetrating element.
 - c. Fabricate pans to at least six (6) inches above the finished roof membrane and with 1/4 inch hem at top edge and with four (4) inch flanges. Round all corners of flange.
 - d. Fabricate metal bonnets for all pans, NO EXCEPTIONS. Fabricate bonnets with metal compatible with metal to which bonnet is to be attached. On beams and other steel, weld in place bonnets fabricated from 1/4 inch steel plate. Draw band bonnets fabricated from 24 gauge stainless steel may be used on circular projections.
- D. Metal Edge:
 - 1. Minimum 22 gauge pre-finished Galvalume Sheet Steel formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates of same profile, four (4) inch flange, maximum seven (7) inch fascia, including a 3/4 inch gravel stop.
 - 2. Provide expansion slip joints at maximum 20 feet on center.
 - 3. Shop fabricate all interior and exterior corners. Fabricate exterior corners with 18 inch minimum to four (4) foot maximum legs. Lap, rivet, and seal prior to delivery to jobsite.
 - 4. Fabricate to sizes and dimensions as indicated on drawings with a minimum one (1) inch coverage past top of wall. Refer to SMACNA Fig. 2-5A.
 - 5. Provide mock-up for Project Manager's approval prior to fabrication.
- E. Continuous Cleats: Minimum 16 gauge, G-90 galvanized finish or stainless steel.
- F. Vent Hoods, Sleeves, Penetration Flashings, and Accessories: Minimum 22 gauge pre-finished Galvalume Sheet Steel, or as shown or directed otherwise.
- G. Angle Termination Bar: One (1) inch x one (1) inch 18 gauge galvanized steel.
- H. Vent Pipe Flashing: Pipe flashings shall be one piece EPDM (ethylene propylene diene monomer) molded rubber boot having a serviceable temperature range of minus 60 degrees F to 270 degrees F and shall be resistant to ozone and ultraviolet rays. Units shall have an aluminum flanged base ring.
- I. Coping:
 - 1. Minimum 22 gauge pre-finished galvanized metal, with six (6) inch wide cover plates of same profile.
 - 2. Fabricate as outlined in SMACNA; Refer to Figure 3-4 A.
 - 3. Provide tapered substrate to slope to one (1) side, and cover with waterproof membrane.

- 4. Install with continuous cleat one (1) side and fasten other side.
- J. Gutters, Downspouts and Collector Heads:
 - 1. Gutters and Downspouts: 22 gauge pre pre-finished Galvalume Sheet Steel formed in maximum ten (10) foot lengths, with six (6) inch wide cover plates. Minimum five (5) inch x six (6) inch box gutter (verify size meets rainfall data per SMACNA).
 - 2. Gutter/Downspout Straps: Minimum 22 gauge pre-finished (match color of gutter) Galvalume Sheet Steel. Hem both sides.
 - 3. Gutter Supports: 24 gauge pre-finished Galvalume Sheet Steel, hemmed around a minimum 1/8 inch galvanized bent steel on aluminum bracket.
 - 4. Gutter Screen: Stainless steel 1/4" diamond wire screen enclosed in a pre-finished steel frame.
 - 5. Collector Head: 22 gauge pre-finished Galvalume Sheet Steel. As outlined in SMACNA; Refer to Figure 1-25F and Figure 1-28 with alternate Section A-A.
- K. Pipe Box Cover: 22 ga. stainless steel.
- L. Heat Exhaust Curbs and Hoods: 22 gauge stainless steel.
- M. Expansion Joint Cover: Minimum 22 ga. pre-finished Galvalume Sheet Steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrates are smooth and clean to extent required to perform sheet metal work.
- B. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set in place.
- C. Verify that reglets, nailers, cants, and blocking to receive sheet metal are in place and free of concrete and soil.
- D. Do not start work until conditions are satisfactory.

3.2 PREPARATION

- A. Field measure site conditions prior to fabrication work.
- B. Install starter and edge strips and cleats before starting installation.

3.3 INSTALLATION

- A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4 inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Pre-fabricated corners or transitions are required at changes in direction, elevation, or plane and at intersections. Locate field joints not less than 12 inches, nor more than three (3) feet from actual corner. Laps shall be one (1) inch, riveted and soldered at following locations:
 - 1. Pre-fabricated corners;
 - 2. transitions;
 - 3. changes in direction, elevation, and plane; and
 - 4. at intersections.

- B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners wherever possible; and set units true to line and level as indicated. Install work with laps, joints, and seams which are permanently watertight and weatherproof.
- C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.
- D. Separations: Provide for separation of metal from dissimilar metal or corrosive substrates by coating concealed surfaces with zinc chromate, bituminous coating, or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials which are incompatible with roofing system.
- E. Continuous Cleat: At exposed edges of perimeter edge, fascias, cap flashings, and where required, attach continuous cleat at six (6) inches on center with appropriate fasteners.
- F. Gravel Guard/Fascia:
 - 1. Install with expansion joints 10 feet o.c., 1/2 inch expansion leeway, with cover plate.
 - 2. Set in asphalt mastic and fasten into nailer at 3 inches o.c. staggered.
 - 3. Buff sand Kynar surface of flange and prime.
 - 4. Strip in flange with specified stripping plies in hot bitumen extending 6 inches from the outer edge of the flange and butt base of gravel stop.
- G. Counter flashing:
 - 1. Do not use surface mount counter flashing
 - 2. Set in through wall with receiver and spring lock counter flashing, as detailed in drawings and to NRCA roofing manual, SMACNA standards.
 - 3. Coordinate installation of through-wall flashing with the masonry contractor.
 - 4. Seal through-wall in conjunction with masonry wall waterproofing.
 - 5. Install wind clips 30 inches o.c. at all counter flashing over five (5) feet in length.
- H. Expansion Joint:
 - 1. Construct wood curbs as shown on drawings and as outlined in the NRCA and SMACNA Manuals.
 - 2. Install underlayment, form envelope, and secure underlayment to curb. Fill envelope with compressible insulation.
 - 3. Securely fasten expansion joint cover to curb with grommetted fasteners spaced six (6) inches on center.
 - 4. Taper expansion joint down at the metal edge.
- I. Gutters, Downspouts and Collector Heads:
 - 1. Install gutters as detailed.
 - 2. Install downspouts plumb and level, attached to columns or wall with straps located at top and bottom of downspout and maximum ten (10) feet on center.
 - 3. Install splash pan over a protection (walkway) pad for downspouts located at roof level.
 - 4. End Caps, Downspout Outlets, Gutter and Downspout Straps, Support Brackets and joint fasteners to be manufactured to suit profile and dimension of gutter and downspout.
 - 5. Install all anchoring devices as outlined in SMACNA.
 - 6. Expansion Joints: Lap or Butt type per SMACNA, locate every 50 linear feet.
- J. Coping:
 - 1. Install wood nailers as shown on drawings.

2. Install metal cleats with appropriate fasteners spaced six (6) inches on center.
3. Install underlayment over the wood substrate. Lap ends minimum of six (6) inches and secure membrane in place. Seal laps with appropriate adhesive.
4. Install metal coping allowing 1/2 inch spaces between segments. Lock coping onto cleat and install appropriate fasteners through the interior fascia spaced 24 inches on center in enlarged holes.
5. Install cover plate centered over coping joint in continuous beads of specified Type B sealant, placed approximately one (1) inch from cover edges. Refer to SMACNA for alternate joints as required by length.
6. Install appropriate fastener through neoprene washer and cover plate between coping segments.
7. Accommodate building wall expansion joints by terminating coping joints and cleats either side of expansion joint. Do not run coping or cleats continuous across joints. Install coping cover plate to span across joint and lap coping on each side of joint a minimum of four (4) inches. Fasten cover plate on one (1) side of joint only. (Provide wall flashing membrane up and over parapet wall in accordance with manufacturer's detail.)
8. Copings wider than 18", or wider than recommended by metal roof system Manufacturer, if provided, shall have joints with raised, interlocking seams. Provide detail(s) for Architect's and Project Manager's approval prior to fabrication and installation.

3.4 CLEANING AND PROTECTION

- A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean of stains.
- B. Remove scraps and debris and leave work area clean.
- C. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. **Painting areas where finish is damaged on prefinished metal by painting is not acceptable; replace damaged panel/item with non-damaged item.**
- D. Prime soldered area of phosphatized metal after cleaning to prevent rusting.
- E. Paint metal flashings that have been soiled with bitumen with aluminized paint.
- F. Clean other work damaged or soiled by Work of this Section.
- G. Protect finished work from damage.

END OF SECTION

Section 07 71 40

Gutters and Downspouts

Specifications

07 71 40-1

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes custom profile gutters, and downspouts.
- B. Coordinate work and drip edge with SBS roofing

1.02 DESIGN REQUIREMENTS

- A. Conform to SMACNA Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.
- B. Perform Work in accordance with SMACNA Manual.
- C. Sizes indicated in drawings are minimum sizes; provide sizes and thickness in accordance with SMACNA and local code compliance; indicate compliance in Submittals.

1.03 SUBMITTALS

- A. Submit profile sections, roof plan, material data indicating sizes and thicknesses of material,
 - 1. Submit calculations for sizes of components, indicating calculations with rainfall intensity to comply with specifications. Indicate number of straps and brackets required for complete installation in compliance with SMACNA and local codes.
 - 2. Submit manufacturer's standard color selection chart.

1.04 WARRANTY

- A. Provide for a 20-year, non-prorated warranty covering fading, chalking and integrity. Warranty shall include labor and materials through the twentieth year.

PART 2 PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

- A. Product Description:
 - 1. Gutters: Pre-finished Sheet Metal; profiles as indicated in drawings.
 - 2. Downspouts: Pre-finished Sheet Metal; size as required by fabricator's approved calculations.
- B. Thickness: 0.024 inch thick.

2.02 ACCESSORIES

- A. Anchors and Supports: Profiled to suit gutters and downspouts; finish to match gutters and downspouts.
- B. Anchoring Devices: In accordance with SMACNA requirements.
- C. Gutter Supports: Straps; finish to match gutters; provide at 36" o.c. maximum spacing.
- D. Downspout Supports: Brackets maximum of 6'-0" o.c.; finish to match downspouts.
- E. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.
- F. Primer: As appropriate for material used (at painted gutters).
- G. Protective Backing Paint: FS TT-C-494, bituminous
- H. Splashblocks: Min. 4000 psi precast concrete, smooth formed, approximate 12" width by 18" length

2.03 FABRICATION

- A. Form gutters and downspouts of profiles and sizes indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; solder watertight.

PART 3 EXECUTION

3.01 PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

Section 07 71 40

Gutters and Downspouts

Specifications

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3.02 INSTALLATION

- A. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
 - 1. Verify that the roof edge fascia board is of sufficient height to accommodate the gutter and the incremental slope occurring on any run from high to low point is adequate.
- B. Slope gutters to facilitate proper drainage.
- C. Seal metal joints for full metal surface contact. After sealing, wash metal clean with neutralizing solution and rinse with water. Sleeve-in downspouts into downspout boots 18" above grade. Seal connection watertight.

END OF SECTION

Section 07 92 00

Joint Sealers

Specifications

07920-1

PART 1 – GENERAL

- 1.01 SECTION INCLUDES
 - A. Preparing sealant substrate surfaces.
 - B. Sealant and joint backing.
- 1.02 SYSTEM DESCRIPTION
 - A. System performance to achieve moisture and joint seals.
- 1.03 SUBMITTALS
 - A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and colors available.
- 1.04 QUALITY ASSURANCE
 - A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
 - B. In the event that sealants of this section conflict with sealants specified in other sections of specifications, the sealant which is higher quality and expense shall be assumed to be the sealant to be used.
- 1.05 ENVIRONMENTAL REQUIREMENTS
 - A. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.
- 1.06 WARRANTY
 - A. 5-year full material & labor against failures in material & workmanship
- 1.07 MOCKUP
 - A. Install a coordinated mockup control joint in brick veneer/exterior wall mockup for approval.

PART 2 – PRODUCTS

- 2.01 SEALANTS
 - A. Silicone Sealant (Type A):
 - 1. Description: ASTM C920, single component, non-staining, non-bleeding, non-sagging type.
 - 2. Product/Manufacturer:
 - a. Silicone 790 manufactured by Dow Corning.
 - b. Spectrem I manufactured by Tremco.
 - c. Pecora 890.
 - d. Substitutions: Section 01 63 00
 - B. Silicone Sealant (Type B):
 - 1. Description: ASTM C920, single component, neutral curing, non-sagging, non-staining, non-bleeding; color as selected.
 - 2. Product/Manufacturer:
 - a. Silicone 791 manufactured by Dow Corning.
 - b. Spectrem 2 manufactured by Tremco
 - c. Pecora 864.
 - d. Substitutions: Section 01 63 00
 - C. Silicone Sealant (Type C):
 - 1. Description: ASTM C920, single component, fungus resistant, non-sagging, non-staining, non-bleeding; color as selected;
 - 2. Product/Manufacturer:
 - a. Parking Structure Silicone Sealant NS by Dow Corning.
 - b. Ultrapruf SCS 2300 by GE.
 - c. Pecora 301S.
 - d. Substitutions: Section 01 63 00
 - D. Silicone Acetoxy Sealant (Type D):
 - 1. Description: ASTM C920, single component, mildew resistant.
 - 2. Product/Manufacturer:
 - a. Silicone 786 manufactured by Dow Corning.
 - b. Tremsil 200 manufactured by Tremco.
 - c. Approved equal.

Section 07 92 00

Joint Sealers

Specifications

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- E. Acrylic Latex Sealant (Type E):
 - 1. Description: single component, for use at interior locations only.
 - 2. Product/Manufacturer:
 - a. Max3500 manufactured by GE
 - b. Equal manufactured by Wesco.
 - c. Approved equal.

2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM D1056 D1565; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.

3.02 INSTALLATION

- A. Clean and prime seal joints in accordance with manufacturer's instructions.
- B. Install sealant in accordance with manufacturer's instructions.
- C. Measure joint dimensions and size materials to achieve 2:1 width/depth ratios.
- D. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width; twisting or braiding of multiple strands of backer rods is not acceptable.
- E. Install bond breaker where joint backing is not used.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave; NOTE: SLOPPY APPLICATION WILL NOT BE ACCEPTED.
- H. Install sealants at brick veneer and CMU control joints shown on drawings.

3.03 SCHEDULE

	LOCATION/SURFACE	TYPE
A.	CMU (Exterior)/Brick	A
B.	Paving	C
C.	Metals	B
D.	Doors & Windows(perimeter)	B
E.	Ceramic Tile/SGFT	D
F.	Gypsum, CMU (Interior)	E

END OF SECTION

Section 08 11 13 Steel Doors and Frames

Specifications

08 11 13 -1

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Seamless flush steel doors with polystyrene core doors and frames – welded frames at all new wall construction; borrow lites; non-rated and fire rated.
- B. Grouting of all interior and exterior frames.

1.02 RELATED SECTIONS

- A. 08 14 16 – Flush Wood Doors
- B. 08 71 00 – Finish Hardware

1.03 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations, frame and installation details, internal reinforcement, cut-outs for glazing, louvers, and finish.
- B. Product Data: Indicate door and frame configurations, location of cut-outs for hardware reinforcement.

1.04 QUALITY ASSURANCE

- A. Conform to the following:
 - 1. SDI-100 - Standard Steel Doors and Frames.
 - 2. Fire Rated Door Panel and Frame Construction: ASTM E152, NFPA 252, UL 10B, NFPA 80.
 - 3. Handicapped: ANSI A117.1.
 - 4. ASI A250.4 Performance Test.
 - 5. ANSI A 250.11 – Recommended Erection Instructions for Steel Frames.
 - 6. ASTM C518 – Thermal Characteristic Value for Core Calculated
 - 7. ASTM C1363 – Thermal Value for Fully Operable Assemblies.
 - 8. ASTM C578 Type 1 – Polystyrene Core
 - 9. ASTM A924 and A653 – G90 Galvanized Face Sheets
 - 10. ASTM A653A-96 – zinc coating A-25 at all exterior locations.

PART 2 PRODUCTS

2.01 DOORS AND FRAMES

- A. Manufacturers:
 - 1. CECO
 - 2. Steelcraft
 - 3. Republic
 - 4. Substitutions: In accordance with Section 01 63 00
- B. Interior Doors: Seamless no visible seams on faces or edges; 18 gage, G90 galvanized face sheets
- C. Exterior Doors: Grade III, steel reinforced.
- D. Exterior & Interior Frames: 14 gage thick material at exterior; 16 gage interiors
- E. Door Core: One-piece polystyrene bonded to the inside of both 18 gag face sheets with a waterproof contact adhesive.
- F. Internally-insulated doors: solid urethane, 0.09 U-Value minimum.

2.02 ACCESSORIES

- A. Silencers: Resilient rubber.
- B. Bituminous Coating: Fibered asphalt emulsion.
- C. Primer: Zinc chromate type.
- D. Anchors: Wire masonry type; drywall types; expansion anchor types; use types as appropriate for existing and new wall construction types.
- E. Door Louvers: Same material and finish as door; provide insect screens.
- F. Glass Stops: Galvanized 20 gauge minimum; mitered corners, prepared for and secured with Phillips head screws, 12" oc maximum, and maximum 3" from corners.

2.03 FABRICATION - DOORS

- A. Fabricate doors with hardware reinforcement welded in place.
- B. Close top and bottom edge of doors with inverted steel channel closure. Seal joints watertight.

Section 08 11 13

Steel Doors and Frames

Specifications

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- C. Provide face sheets, thicknesses, stiffeners, vertical, top, and bottom edges, glass stops in accordance with HMMA 861.
- D. Include a 1/8" in 2" vertical edge bevel. Provide 2-1/8" radius at double-acting doors.

2.04 FABRICATION - FRAMES

- A. Fabricate frames as welded unit
 - 1. Provide additional hardware as necessary and required for installation in fire-rated conditions.
- B. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- C. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- D. Prepare frame for silencers and install; 3 per strike jamb on single doors, and 2 per head for pair of doors; stick-on silencers are not permitted. Exterior frames shall not be punched for mutes.
- E. Attach fire rated label to each frame unit.
- F. Frame dimensions:
 - 1. Face: 2 inches
 - 2. Width: 5 3/4 inches at 3 5/8" stud walls and CMU walls. Provide width and throat dimension as required at stud walls to accommodate existing and proposed finish wall thickness.
 - 3. Head: 2 inches at gyp board, 4 inches at CMU walls;
 - 4. Coordinate and verify requirements for frame dimensions with drawings and schedules.
- G. Provide construction, floor and jamb anchors, mortar guards, and loose glazing stops in accordance with product model specified. Frame anchors shall be spaced at 24" o.c. maximum along each jamb. Provide floor clips at the base of each jamb.
- H. Borrow Lites: Prime paint frame and stops same as door frames. Locate stops on secured side of door or frame. Glass stop material to be a minimum of 20-gauge, galvanized for locations.

2.05 FINISH

- A. Steel Sheet: Galvannealed to ASTM A924 and A653.
- B. Primer: Baked.
- C. Coat inside of frame profile with bituminous coating.
- D. To be field painted under Section 09 90 00.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install doors and frames in accordance with ANSI/SDI-100.
- B. Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.
- C. Coordinate with wall construction for frame anchor placement.
- D. Glazing stops shall be applied at interior side of frames.
- E. Fill frame perimeter crevasses at exterior frames with Thermafiber insulation or approved equal.
- F. All interior and exterior frames shall be grouted at jambs.
- G. If countersunk anchors are used, fill depressions with a (two-part polyester resin, metal-reinforced) non-shrink filler prior to priming and painting frames.

3.02 TOLERANCES

- A. Max Diagonal Distortion: 1/16" measured with straight edge, corner to corner.

END OF SECTION

Section 08 14 16

Flush Wood Doors

Specifications

08 14 16 -1

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prefinished flush wood doors, installed in new steel frames; fire rated and non-rated.
- B. Doors shall be pre-machined.

1.02 RELATED SECTIONS

- A. Section 08 11 00 - Steel Door Frames.
- B. Section 08 71 00 - Finish Hardware.

1.03 REFERENCES

- A. AWI - Quality Standards of the Architectural Woodwork Institute.
- B. NFPA 80 - Fire Doors and Windows.
- C. NFPA 252 - Standard Method of Fire Tests for Door Assemblies.
- D. UL (Underwriter Laboratories) - Building Materials Directory.
- E. UL 10B - Fire Tests of Door Assemblies.
- F. WH (Warnock Hersey) - Directory of Listed Products.

1.04 SUBMITTALS FOR REVIEW

- A. Submit schedule of doors to be provided with product data and fire rating required.
- B. Provide manufacturer's certification that door meets AWI standards and fire rating
- C. Provide manufacturer's standard color chip for selection of door finish; at Architect's request, manufacturer shall provide a 12" x 24" sample with selected finish, edge, lock cut-out (glass lite and frame if applicable.)
- D. Contractor shall provide hardware schedules, and relevant information for existing frames to door manufacturer prior to submittals of this Section to Architect.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Quality Standard Section 1300, Custom Grade.
- B. Finish doors in accordance with AWI Quality Standard Section 1500.
- C. Fire Door Construction: Conform to NFPA 252.
- D. Fire Door Installation: Conform to NFPA 80 for fire rated class as scheduled.
- E. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- F. Provide limited lifetime warranty for workmanship of door construction.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

- A. Coordinate work with door opening construction, frame, and door hardware installation.

1.08 WARRANTY

- A. Life of installation against delaminating, core component telegraphing, and warp or twist.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Algoma Hardwoods, Inc.
- B. Marshfield Door Systems, Inc.
- C. Graham
- D. Substitutions: In accordance with Section 01 63 00

2.02 DOOR TYPES

- A. Flush Interior Doors: 1-3/4 inches thick; solid core construction.

Section 08 14 16 Flush Wood Doors

Specifications

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2.03 DOOR CONSTRUCTION

- A. Core (Solid, Non-Rated): AWI Section 1300, Kiln dried staved lumber core.
- B. Core (Solid, Rated): AWI Section 1300, Type FD as necessary.

2.04 FLUSH DOOR FACING

- A. Veneer Facing (Flush Wood Finish): AWI Premium species wood, species and cut as indicated in the Drawings.

2.05 FABRICATION

- A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
- B. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL or Warnock Hersey requirements. Attach fire rating label to door.
- C. Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.
- D. Vertical Exposed Edge of Stiles: Of same species as veneer facing for custom stain finish to be determined by the Architect.
- E. Provide edge clearances in accordance with AWI 1600.
- F. Install fire rating label on hinge side of door.
- G. Machine doors for hinges, locksets, and all other hardware prior to finishing.

2.06 FINISH

- A. Finish: Factory pre-finished stain; AWI Finish System TR-6, catalyzed polyurethane; custom color to be selected by Architect.
- B. Finishing Process/ Requirements:
 - 1. Two UV (ultraviolet) sanding sealer coats.
 - 2. Sealer is sanded down between each coat.
 - 3. First top coat: Clear catalyzed polyurethane material applied.
 - 4. First top coat, sanded with fine sand paper, (200 - 320 grit)
 - 5. Final top coat: second coat applied of clear catalyzed polyurethane material
 - 6. UV cure after finishing process is complete.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes and tolerances are acceptable.
- B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install non-rated doors per AWI Premium Quality Standards requirements.
- B. Trim doors only by approval of Architect; if doors are trimmed, re-seal and stain door edges (to match factory finish) prior to installation of door.
- C. Machine cut for hardware only by approval of Architect.
- D. Coordinate installation of doors with installation of frames specified in Section 08 11 00 or existing conditions at existing frames.
- E. Install fire-rated doors in accordance with AWI Quality Standard, NFPA 80, and to requirements for fire rating label by UL or Warnock Hersey.
- F. Fire rated doors: Trim door only in accordance with fire rating requirements.

3.03 INSTALLATION TOLERANCES

- A. Conform to AWI requirements for fit and clearance tolerances.
- B. Conform to AWI Section 1300 requirements for maximum diagonal distortion.

3.04 ADJUSTING

- A. Adjust door for smooth and balanced door movement.
- B. Adjust closer for full closure.

3.05 SCHEDULE

- A. Refer to Door and Frame Schedule on drawings.

Section 08 14 16
Flush Wood Doors
Specifications

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END OF SECTION

Section 08 16 13

Fiberglass Reinforced Plastic Doors and Frames

Specifications

01 60 00-1

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass Reinforced Plastic (FRP) Doors and Frames

1.2 RELATED SECTIONS

- A. 04 20 00 – Concrete Unit Masonry
- B. 08 71 00 – Door Hardware
- C. 08 80 00 - Glazing

1.3 REFERENCES

- A. Fire-rated door and frame construction will conform to tested products under ASTM E152, NFPA 252 & UL10C.
- B. Install door and frame assembly in conformance with NFPA 80 for fire-rated class, ANSI A117.1 specifications for ADA requirements, handicap accessibility.
- C. A flame spread classification of 25 or less per ASTM E84 will apply to all FRP component parts and shall be self-extinguishing per ASTM D635.
- D. Swinging Door Test, Doors and Frames, AAMA 920-03, ANSI A250.4-2001 (supersedes ANSI A-151.1), NWWDA TM-7: In excess of 1,000,000 cycles.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate door and frame elevations, internal reinforcement, cut-outs for glazing, louvers, finish, and anchor types.
- B. Product Data: Manufacturer's detailed specification of construction and fabrication, and installation instructions.

1.5 QUALITY ASSURANCE

- A. All doors and frames shall be by a single manufacturer, shop drawings to be submitted with manufacturer's insignia which is being supplied.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in accordance with manufacturer's instructions, and as follows:
 - 1. In manufacturer's original, labeled, undamaged containers or wrappers.
 - 2. Containers or wrappers shall list the name of the manufacturer and product.
- B. Deliver materials to allow for minimum storage time at the project site. Coordinate delivery with the scheduled time of installation.
- C. Protect products from moisture, construction traffic, and damage.
 - 1. Store under cover in clean dry place, protected from weather or abuse.
 - 2. Store in a manner that will prevent rust or damage.
 - 3. Store doors in a vertical position, spaced with blocking to permit air circulation.
 - 4. Do not use non-vented plastic or canvas shelters.
- 5. Should containers or wrappers become wet, remove immediately.

1.7 WARRANTY

- A. Warrant the work specified herein for one (1) year against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship.
- B. Defects shall include, but not be limited to:
 - 1. Use of incorrect materials in opening

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Fiberglass Reinforced Plastic Doors and Frames

Specifications

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2. Incorrect labeled components installed within opening.
3. Noisy, rough or difficult operation
4. Failure to meet specified quality assurance requirements.

PART 2 - PRODUCTS

2.1 DOORS AND FRAMES

- A. Manufacturers:
1. Simon Door Company, LLC
 2. Overly/Tiger Door
 3. Chase Doors, Inc.
 4. Substitutions: 01 60 00

2.2 FRAMES

- A. General: Fabricate frames of fiberglass reinforced plastic.
1. Head and Jamb: Pultruded fiberglass reinforced plastic, minimum 1/4" wall thickness, conforming to SDI requirements.
 2. Frame Profile: Double rabbeted with 5/8" stop. Face will be 2" at jambs and 4" at heads, with a standard jamb depth of 5 3/4".
 3. Joint Connection: Jamb to Head joints will be neatly mitered at 45 degrees
 4. Finish: 15 mil +/- 3 mil gel coat finish. Color to match door unless otherwise indicated.
- B. Reinforcements
1. Corner: Reinforcement at frame corner will be pultruded fiberglass angle, 4" x 4" x 5 3/8" x 1/4"
 2. Hardware: Frames will incorporate non-woven polyester fabric at mortise hinge, closer and strike locations for unparalleled screw-holding strength.
- C. Anchoring Systems
1. Wire anchors are recommended for masonry construction
 2. New Masonry
 - a. Wire Type
 - b. FRP Base Anchor

2.3 DOORS

- A. Fiberglass Reinforced Plastic Doors
1. Face Panels: Standard face panels shall be chemical resistant, using a fiberglass-reinforced polyester resin system with light stabilizing additives. Thickness of panels shall be 0.090 to 0.125, with a standard of 0.120".
 2. Door Thickness: 1 3/4"
 3. Finish: All surfaces shall have a textured, semi-gloss, seamless gel coat finish. Gel Coat coverage shall be 15 mil thick plus or minus 3 mils.
 4. Color: As selected by architect from manufacturer's custom colors.
- B. Internal Construction
1. Stiles and Rails shall be constructed of rectangular and square high modulus pultruded fiberglass tubes.
 2. Core material as application dictates.
 - a. Honeycomb Core, Phenolic impregnated resin honeycomb
 - b. Polyurethane Foam Core, 1 1/2" thick rigid block of polyurethane with an "R" factor of R-12 shall be laminated to the interior of the face panels.
 - c. Mineral Core, fire rated up to 90 minutes.
 3. Internal reinforcements for full mortise hinges to be solid FRP blocking and for thru-bolted hardware to be high modulus pultrusions.

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Fiberglass Reinforced Plastic Doors and Frames

Specifications

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C. Door Accessories

1. Windows: Glazing support structures and window lite retainers shall be fabricated from high modulus pultrusions and/or fiberglass composition common to the door construction. The opening itself shall be sealed in such a manner as to prevent moisture or contaminants from penetrating the interior of the door. Polyvinyl window retainers will not be acceptable.
2. Louvers: Door louvers shall be constructed using FRP material in an inverted "v" type design and will adhere to the same guidelines as window openings above.
3. Transoms: All transom panels will be identical to the doors in materials, construction, thickness, finish and color.
4. Astragals: Astragals for pairs of doors will be fabricated of FRP material in the manufacturer's standard design.
5. Fire rated door accessories will be manufactured or supplied in compliance with the labeling agency and in accordance with ULIOC.

2.4 FABRICATION

- A. Fabricate FRP doors and frames rigid, neat in appearance and free from defects.
- B. Form to sizes and profiles as indicated on drawings.
- C. In compliance with the hardware manufacturer's instructions and templates, doors and frames shall be mortised and reinforced for hardware, including hinges, locks, strikes, closers, etc.
- D. Bottom of frames will terminate at the indicated finished floor level.
- E. Clearances will be as follows:
 1. Jambs and Head: 1/8 inch plus or minus 1/16 inch
 2. Between Edges and Pairs of Doors: 1/8 inch plus or minus 1/16 inch
 3. Between Bottom of Door and Threshold: Maximum 3/8 inch
 4. Between Bottom of Door and Top of Finish Floor: Maximum 3/4 inch

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Separate dissimilar metals. Protect against galvanic action.
- B. Frames:
 1. Anchorage and Connections: Secure to adjacent construction. Where practical, interior door frames shall be flush with the pull side wall to minimize or eliminate the reveal and allow full 180 degree door swing.
 2. Install frames in accordance with manufacturer's instructions and install labeled frames in accordance with NFPA 80.
 3. Frame Spreader Bars: Leave intact until frames are set perfectly square and plumb and anchors are securely attached.
- C. Doors:
 1. Install hardware in accordance with hardware manufacturer's templates and instructions.
 2. Install doors in accordance with manufacturer's instructions and install labeled doors in accordance with NFPA 80.
 3. Adjust operable parts for correct function.
 4. All interior and exterior frames shall be grouted (after placement of any conduit for devices).

3.2 ADJUST AND CLEAN

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Fiberglass Reinforced Plastic Doors and Frames

Specifications

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- A. Adjust doors for proper operation, free from binding or other defects.
- B. Clean and restore soiled surfaces.
- C. Remove scraps and debris and leave the site in clean condition.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coiling Metal Counter Doors With Integral Frame

1.2 RELATED SECTIONS

- A. Section 055000 - Metal Fabrications: Support framing and framed opening.
- B. Section 061000 – Rough Carpentry: Wood jamb and head trim.
- C. Section 087100 - Door Hardware: Product Requirements for cylinder core and keys.
- D. Section 099000 - Painting: Field applied finishes.

1.3 REFERENCES

- A. ASTM A 123 - Standard specification for Zinc (hot-dipped galvanized) coating on iron and steel products.
- B. ASTM A 229 - Standard specification for Steel wire, oil-tempered for mechanical springs.
- C. ASTM A 653 - Standard specification for Steel sheet, zinc-coated (galvanized) by the hot-dipped process, commercial quality.
- D. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- F. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- H. NEMA MG 1 - Motors and Generators.
- I. NFPA-80 – Standard for Fire Doors and Fire Windows.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Fire Rated Assemblies: Provide assemblies complying with NFPA 80 and listed in UL Directory or Intertek Testing Services (Warnock Hersey Listed) Directory.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Details of construction and fabrication.
 - 4. Installation methods.

Section 08 33 13 Coiling Counter Doors

Specifications

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- C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking, adjustment and maintenance of all components.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.
- 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
- C. Store materials in a dry, warm, ventilated weathertight location

1.8 SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.
- B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

PART 2 PRODUCTS

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2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Wayne Dalton; 2501 S. State Highway 121 Business, Suite 200, Lewisville, TX 75067. ASD. Phone: (800) 827-3667; Web Site: www.wayne-dalton.com. Email: info@wayne-dalton.com.
- B. Equal Products by the following manufacturers.
 - 1. Cornell
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 COILING METAL COUNTER DOORS

- A. Coiling Metal Counter Doors: Model 500.
- B. Curtains:
 - 1. Material: Flat faced, 2 inch, No. 17 slats fabricated of:
 - a. Extruded aluminum 0.050 inch thick, 16 B&S gauge.
 - 2. Alternate slats will be fitted with end locks to hold curtain in alignment.
 - 3. Bottom of curtain finished with an extruded, tubular, or single angle bottom bar fitted with a continuous vinyl bumper to protect counter top.
- C. Guides: Extruded aluminum. Continuous strips of wool pile are inserted into guides to eliminate metal-to-metal contact and to provide dust-seal around curtain.
- D. Brackets: Metal plates with permanently sealed ball bearings designed to enclose ends of coil and provide support for counterbalance pipe at each end. Plated fabricated of:
 - 1. Extruded aluminum 1/8 inch thick minimum.
- E. Counterbalance: Curtain is coiled on a pipe of sufficient size to carry door load with a deflection not to exceed 0.033 inch per foot of door span and to be correctly balanced by helical springs, oil tempered torsion type. Cast iron barrel plugs are used to anchor springs to tension shaft and pipe.
- F. Hood: Hood will enclose curtain coil and counterbalance mechanism and is fabricated of sheet metal, flanged at top for attachment to header and flanged at bottom to provide longitudinal stiffness.
 - 1. Aluminum, 22 gauge B&S
- G. Finish: Curtain, bottom bar, and hood to be finished as follows:
 - 1. Clear anodized aluminum.
- H. Manual Operation:
 - 1. Manual push-up.
- I. Locking
 - 1. Curtain to be locked at each end of bottom bar by concealed slide bolts which engage in a developed slot in each guide.
 - 2. Provide cylinder lock at jambs or in center of bottom bar.
 - 3. Locks on electric-motor operated doors, shall be provided with electric interlocks to prevent operation when lock bolts are engaged in the guides.
- J. Mounting: Overhead Structure with:
 - 1. Drywall over 16 gauge minimum steel studs or wood stud jambs.

PART 3 EXECUTION

3.1 EXAMINATION

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Coiling Counter Doors

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- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- F. Install perimeter trim and closures.
- G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Section 08 41 13 Aluminum Entrances and Storefronts

Specifications

08 41 00 -1

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum storefront framing, entrance doors and hardware.
- B. Storefront contractor shall be responsible for providing and matching existing locking mechanisms.

1.02 RELATED SECTIONS

- A. Section 08 71 00 – Door Hardware
- B. Section 08 80 00 – Glazing: Vision glass and glazing.

1.03 REFERENCES

- A. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
- B. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.
- C. ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
- D. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- E. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.04 SYSTEM DESCRIPTION

- A. Aluminum entrances and storefront includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory finished, vision glass, related flashings, anchorage and hardware.
- B. System Assembly: Shop unitized assembly.
- C. Cylinders: Provided in Section 08 71 00.

1.05 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall:
 - 1. As calculated in accordance with code,
 - 2. As measured in accordance with ASTM E330.
- B. Deflection: Limit mullion deflection to 1/200 of span; with full recovery of glazing materials.
- C. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
- E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
- F. Water Leakage: None, measured in accordance with ASTM E331 test pressure difference of 2.86 lbf/sq ft.
- G. Expansion / Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12-hour period without causing detrimental effect to system components and anchorage.
- H. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.06 SUBMITTALS FOR REVIEW

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware and internal drainage details. Provide cylinder information.
- B. Design Data: Provide framing member structural and physical characteristics, dimensional limitations.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA - Window, Storefront Entrance - Guide Specifications Manual.
- B. Conform to requirements of ANSI A117.1.
- C. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years experience.

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1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Handle Products of this section in accordance with AAMA -
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.09 WARRANTY

- A. Correct defective Work within a five year period after Substantial Completion.
- B. Warranty: Include coverage for complete system for failure to meet specified requirements.
- C. Provide five year manufacturer warranty for glazed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Kawneer.
- B. Oldcastle
- C. Substitutions: In accordance with Section 01 63 00

2.02 STOREFRONT EXTERIOR

- A. SYSTEM
 - 1. Vertical and horizontal framing members shall have a nominal face dimension of 2". Overall frame depth shall be 4 1/2". Glass stops are to be beveled. Entrance framing members shall be compatible with glass framing in appearance. All single acting entrance frames shall include positive barrier weathering.
- B. PRODUCTS
 - 1. Kawneer Trifab 451UT
 - 2. equal to Trifab 451UT by Oldcastle

2.03 STOREFRONT EXTERIOR (6")

- A. SYSTEM
 - 1. Vertical and horizontal framing members shall have a nominal face dimension of 2". Overall frame depth shall be 6". Glass stops are to be beveled. Entrance framing members shall be compatible with glass framing in appearance. All single acting entrance frames shall include positive barrier weathering.
- B. PRODUCTS
 - 1. Kawneer Trifab 601UT
 - 2. equal to Trifab 601UT by Oldcastle

2.04 STOREFRONT INTERIOR

- A. SYSTEM
 - 1. Vertical and horizontal framing members shall have a nominal face dimension of 1 3/4". Overall frame depth shall be 4 1/2". Glass stops are to be beveled. Entrance framing members shall be compatible with glass framing in appearance. All single acting entrance frames shall include positive barrier weathering.
- B. PRODUCTS
 - 1. Kawneer Trifab VersaGlaze 450 Standard
 - 2. equal to Trifab VersaGlaze 450 Standard by Oldcastle

2.05 ENTRANCE DOORS

- A. SYSTEM
 - 1. Heavy stile, single acting, custom height doors; see 2.06 for hardware.
- B. PRODUCTS
 - 1. Kawneer Tuffline
 - 2. equal to Tuffline by Oldcastle

2.06 GLASS AND GLAZING MATERIALS

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- A. Glazing Materials: Type to suit application to achieve weather, moisture, and air infiltration requirements. As specified in Section 08 80 00.
- 2.07 SEALANT MATERIALS
 - A. Sealant and Backing Materials:
 - 1. Perimeter Sealant: As specified in Section 07 92 00.
- 2.08 HARDWARE
 - A. Weather Stripping, Sill Sweep Strips: Manufacturers standard type to suit application.
 - B. Refer to section 08 71 00 for balance of hardware
- 2.09 FABRICATION
 - A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
 - B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
 - C. Prepare components to receive anchor devices. Fabricate anchors.
 - D. Arrange fasteners and attachments to conceal from view.
 - E. Prepare components with internal reinforcement for door hardware.
 - F. Reinforce framing members for imposed loads.
- 2.10 FINISHES
 - A. Exterior Exposed Aluminum Surfaces: Clear Anodized, Class I
 - B. Interior Exposed Aluminum Surfaces: Clear Anodized, Class II
- PART 3 EXECUTION**
- 3.01 EXAMINATION
 - A. Verify dimensions, tolerances, and method of attachment with other work.
 - B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- 3.02 INSTALLATION
 - A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.
 - B. Attach to structure to permit adjustment to accommodate construction tolerances and other irregularities.
 - C. Provide alignment attachments and shims to permanently fasten system to building structure.
 - D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
 - E. Provide thermal isolation where components penetrate or disrupt building insulation.
 - F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
 - G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
 - H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
 - I. Install flashings and trim.
 - K. Install hardware using templates provided.
 - L. Install glass in accordance with glazing method required to achieve performance criteria.
 - M. Install perimeter sealant to method required to achieve performance criteria, backing materials, and installation criteria in accordance with Section 07 92 00.
- 3.03 ERECTION TOLERANCES
 - A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 feet.
 - B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- 3.04 ADJUSTING/CLEANING
 - A. Adjust operating hardware for smooth operation.
 - B. Remove protective material from pre-finished aluminum surfaces.
 - C. Wash down all surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
 - D. Remove excess sealant by method acceptable to sealant manufacturer.

END OF SECTION

Section 08 51 13 Aluminum Windows

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PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes Architectural Aluminum Windows including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of window units.
 - a. Types of aluminum windows include:
 - 1. Single Hung Window
 - 2. 4" (101.6) frame depth
- B. Related Sections:
 - a. Section 079200 – Joint Sealants
 - b. Section 072726 – Fluid Applied Membrane Air Barriers
 - c. Section 084113 – Aluminum Entrances and Storefronts

1.03 DEFINITIONS

- A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufacturers Association (AAMA) – AAMA Glossary (AAMA AG)

1.04 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed window system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Window Performance Requirements:
 - a. Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS)
 - 1. Performance Class and Grade: AW-PG70 – 60" x 99" (1524 x 2515 mm)-H.
 - b. Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. The air leakage rate shall not exceed 0.30 cfm/ft² (1.5 L/s·m²) at a static air pressure differential of 6.2 psf. (300 Pa).
 - c. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331 and ASTM E 547. There shall be no leakage as defined in the test method at a static air pressure differential of 10 psf. (479 Pa).
 - d. Uniform Load Deflection: A minimum static air pressure difference of 70 psf. (3352 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member.
 - e. Uniform Load Structural Test: A minimum static air pressure difference of 105 psf. (5027 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. The unit shall be evaluated after each load.
 - f. Component Testing: Window components shall be tested in accordance with procedures described in AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
 - g. Energy Efficiency:
 - 1. Thermal transmittance simulation results using NFRC 100 or AAMA 507 are based on a Center of Glass (COG) U-factor of 0.24 Btu/(hr·ft²·°F) and a warm-edge spacer.
 - A. U-Factor not more than 0.46 BTU/hr/sf/°F per AAMA 507 or NFRC 100 when using project specified glass.
 - 2. Condensation Resistance Test (CTF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than CRF 55_{frame} and 62_{glass} or Temperature Index (1): When tested to CSA-A440-00, the Temperature Index shall not be less than 43_{frame} and 60.3_{glass} (clear).

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- C. Environmental Product Declarations (EPD): Shall have a Type III Product-Specific EPD created from a Product Category Rule.

1.05 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instruction for each type of aluminum window indicated.
- B. Shop Drawings: Include plans, evaluations, sections, details, hardware, attachments to other work, operational clearances and installation details.
- C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.
- D. Samples for Verification: For aluminum windows and components required.
- E. Product Schedule: For aluminum windows, use same designations indicated on drawings.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An installer which has had successful experiences with installation of the same or similar units required for this project and other projects of similar size and scope.
- B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
- C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.
 - a. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - a. Build mockup for type(s) of window(s) indicated, in location(s) shown on drawings.
- F. Pre-Installation Conference: Conduct conference at Project Site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.07 PROJECT CONDITIONS

- A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.08 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
 - a. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.
- B. Insulating Glass: Warranted to be free from defects (excluding breakage) for a period of five (5) years.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Basis-of-Design Product:
 - a. Kawneer Company, Inc.
 - b. Model 8430TL Single Hung Window

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- c. 4" (101.6 mm) frame depth
- B. Subject to compliance with requirements, provide a comparable product by the following manufacturer:
 - a. Oldcastle
- C. Substitutions: Refer to Substitutions Section for procedures and submission requirements.
- D. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.02 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.78 mm) wall thickness at any location for the main frame and sash members.
- B. Thermal Barrier:
 - a. Thermal Barrier: The thermal barrier shall be Kawneer IsoLock® with a nominal 1/4" (6.35 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum, or approved equal.
- C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.03 WINDOW SYSTEM

- A. Series 8400TL Thermal Windows – Single Hung Window.

2.04 GLAZING

- A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.
- B. Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone black bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gasket in accordance with AAMA 702 or ASTM C864.

2.05 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
- B. Single Hung Window Typical Hardware:
 - a. Sash Balances: A Class 1 or Optional Class 5; spring balance with stainless steel or other corrosion-resistant components.
 - b. Handle: Continuous, integral, bottom sash lift handle.
 - c. Sash Lock: Zinc die cast cam-action sweep lock and keeper on meeting rails. One or two per sash as required by size. Powder coating finish.
 - d. Limit Device: Sash stop limit device; for bottom sash located at jamb; two per sash.
- C. Exterior Panning and Interior Trims: Extruded aluminum, 6063-T6 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer's standard sealant to assure water-tight joints.
 - a. Exterior Panning and Trims: All panning profiles shall be a minimum thickness of 0.062" (1.57 mm) to match the profiles as shown in the drawings. Any profile variations shall be submitted to the Architect and/or Owner for approval 10 days prior to bid date. All panning shall be factory

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fabricated for field assembly. All corner joinery shall be factory cut. Joinery at the sill shall be copied and butt-type construction. All preparations for assembly shall be completed by the window manufacturer. Upon assembly, panning frame joints shall be back-sealed to prevent moisture penetration.

- b. Interior Trims: The interior face trim minimum wall thickness shall be 0.062" (1.57 mm). The face trim shall snap-fit onto concealed mounting clip. Exposed fasteners shall not be accepted. The mounting clip shall be extruded aluminum of 6063-T6 alloy and temper. The minimum wall thickness shall be 0.062" (1.57 mm). The trim clips shall be provided in 4" (101.6 mm) lengths and spaced a maximum of 18" (457.2 mm) center to center.

2.06 FABRICATION

- A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - a. Profiles that are sharp, straight, and free of defects or deformations.
 - b. Accurately fit joints; make joints flush, hairline and weatherproof.
 - c. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - d. Physical and thermal isolation of glazing from framing members.
 - e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - f. Provisions for field replacement of glazing.
 - g. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- B. Window Frame Joinery: Screw-spline, factory sealed frame and vent corner joints.
- C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- D. Fabricate aluminum windows that are re-glazable without dismantling sash or framing.
- E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- F. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093" (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.
- G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440-08 (NAFS).
- H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match frame.

2.07 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designing aluminum finishes.
- B. Factory Finishing:
 - a. Architectural Class | Color Anodic Coating (Color TBD),

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings,

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vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.

- a. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
- b. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3" (76.2 mm) of opening.
- c. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
- d. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturers' written instructions for installing windows, hardware, accessories, and other components.
- B. Install aluminum-framed window system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.
- D. Install aluminum-framed window system and components to drain condensation, water penetration joints, and moisture migrating within system to the exterior.
- E. Separate aluminum from dissimilar materials to prevent corrosion or electrolytic action at points of contact.

3.03 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
 - a. Testing and inspection agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - a. Testing Methodology: Testing Standard shall be per AAMA 502 including reference to ASTM E 783 for Air Leakage Test and ASTM E 1105 for Water Penetration Test.
 1. Air Leakage Test: Conduct test in accordance with ASTM E 783 at a minimum uniform static test pressure of 6.2 psf. (300 Pa). The maximum allowable rates of air leakage for field testing shall not exceed 1.5 times the project specifications.
 2. Water Infiltration Test: Water penetration resistance tests shall be conducted in accordance with ASTM E 1105 at a static test pressure equal to 2/3 the specified water test pressure.
 - b. Testing Extent: Architect shall select window units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present.
 - c. Test Reports: Shall be prepared according to AAMA 502.

3.04 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.
- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean glass immediately after installing windows. Comply with manufacturers' written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating

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substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

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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 commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 4. Division 08 Section "Fire-Rated Steel Framed Entrances".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437 - Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

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- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

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1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Hardware Supplier and Hardware Installer must obtain a license with the Louisiana Office of State Fire Marshall in accordance to RS 40:1464 and RS 40:1664.
- B. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- C. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- D. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- E. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.
- F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

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1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.
- 1.6 DELIVERY, STORAGE AND HANDLING
- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
 - B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
 - C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".
- 1.7 COORDINATION
- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
 - B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
- 1.8 WARRANTY
- A. General Warranty: Reference Division 01, General Requirements. Special warranties 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.
 - B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.

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- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5-knuckle.
 - c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.3 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

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1. Manufacturers:
 - a. Hager Companies (HA).
 - b. Pemko (PE).
 - c. dormakaba BEST (ST).

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

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4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Match Facility Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
 4. Construction Control Keys (where required): Two (2).
 5. Permanent Control Keys (where required): Two (2).
- F. Construction Keying: Provide temporary keyed construction cores.
- G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.7 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.

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- b. Sargent Manufacturing (SA) - 8200 Series.
- c. Schlage (SC) - L9000 Series.

2.8 MULTI-POINT LOCKS AND LATCHING DEVICES

- A. Multi-Point Locksets: Vertical rod locking devices designed for openings requiring multiple latching points within one locking mechanism. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:
 - a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
 - b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - c. Meets Florida Building Code FL2998 and UL Certification Directory ZHEM.R21744 for latching hardware for hurricane requirements.
 - d. Five-year limited warranty for mechanical functions.
2. Electromechanical locksets shall have the following functions and features:
 - a. Motor driven electric latch retraction that supports electrified dogging.
 - b. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable to fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - c. Uses standard electric hinge; no special power transfer required.
 - d. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
3. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - MP9800 Series.
 - b. Sargent Manufacturing (SA) - 7000 Series.
 - c. Schlage (SC) - LM9200 Series.

2.9 DEADLOCKS AND LATCHES

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DL4000 Series.
 - b. Sargent Manufacturing (SA) - 4870 Series.
 - c. Schlage (SC) - L460 Series.

- B. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8" diameter bolts.

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1. Manufacturers:
 - a. Adams Rite Manufacturing (AD) - MS1850S / MS1950 Series.
 - b. Adams Rite Manufacturing (AD) - 4900 Series.

2.10 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 1. Exit devices shall have a five-year warranty.
 2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

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8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.12 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard..

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. LCN Closers (LC) – 4040XP Series.
 - c. Norton Rixson (NO) - 7500 Series.
 - d. Sargent Manufacturing (SA) - 351 Series.

2.13 ARCHITECTURAL TRIM AND ACCESSORIES

A. Door Protective Trim:

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1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.14 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.15 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

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1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
 - D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
 - E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
 - F. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko (PE).
 3. Reese Enterprises, Inc. (RE).
- 2.16 ELECTRONIC ACCESSORIES
- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 1. Manufacturers:
 - a. Alarm Controls (AK) - CP1-1026 Series.
 - b. Security Door Controls (SD) - DPS Series.
 - c. Securitron (SU) - DPS Series.
- 2.17 FABRICATION
- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.
- 2.18 FINISHES
- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
 - B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
 - C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

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3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney

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- 2. PE - Pemko
- 3. RO - Rockwood
- 4. RU - Corbin Russwin
- 5. AD - Adams Rite
- 6. OT - Other
- 7. SU - Securitron

Hardware Sets based on plans dated 09/26/2025

Set: 1.0

Doors: 100.1, 100.2, 110.1

Description: Pair - Exterior - ASF - NL/DT - Closer w/Stop Arm

2	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Concealed Vert Rod Exit, Storeroom	ED4800 O859ET M110 CT*R	630	RU
1	Concealed Vert Rod Exit, Exit Only	ED4800 EO	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
2	Door Pull	BF157 Mtg-Type 12HD	US32D-MS	RO
2	Surface Closer	DC8210 A11 M54	689	RU
1	Perimeter Seals	By the frame manufacturer		OT
2	Sweep	18061CNB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE
2	Position Switch	DPS-M/W-BK (as req'd per app)		SU
1	Astragal	By the door manufacturer		OT

Notes: Confirm hardware compatibility with aluminum door manufacturer.

Set: 2.0

Doors: 205.2, 206.2, 207.2, 210.2, 211.2, 212.2

Description: Sgl - Ext ASF - AR Deadlatch - Terrace Inswing

1	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Deadlatch	4900	628	AD
1	Lever Operator	4600 (deadlatches) 02-Round	US32D	AD
1	Deadlatch Lever	3080 02-Round	US32D	AD
1	Interchangeable Core	LFIC 59A1	626	RU
1	Cylinder	Confirm Type - CT*R	630	RU
1	Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1	Drop Plate	754F25	689	RU
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
1	Perimeter Seals	By the frame manufacturer		OT
1	Sweep	18061CNB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE

Notes: Confirm hardware compatibility with aluminum door manufacturer.

Set: 3.0

Doors: 118.1

Description: Pr - Ext ASF - AR Deadlock

2	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt	555 / 557 12" / 72" AFF	US26D	RO
1	Strike	MS4002 1 - Radius for pairs of doors	628	AD
1	Mortise Deadlock	MS1850S	628	AD
1	Interchangeable Core	LFIC 59A1	626	RU
1	Thumbturn Cylinder	4066		AD
1	Cylinder	Confirm Type - CT*R	630	RU

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2	Push Bar & Pull	BF15747	US32D	RO
2	Drop Plate	754F25	689	RU
2	Surface Closer	DC8210 A11 M77	689	RU
1	Perimeter Seals	By the frame manufacturer		OT
2	Sweep	18061CNB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE
1	Status Indicator	4089		AD

Notes: Confirm hardware compatibility with aluminum door manufacturer.

**Confirm locking arrangement with local authorities.

Doors to remain unlocked during business hours.

Set: 4.0

Doors: 129.1, 130.1, 131.1

Description: Pr - Ext ASF - Multipoint CR X DT

2	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Multi-Point Lock (Storeroom)	MP9800xE59xN10 L MPAD CT*R	626	RU
1	Multi-Point Lock (Dummy Trim)	MP9800xE40xN10 L MPAD	605	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Cylinder	Confirm Type - CT*R	630	RU
2	Drop Plate	754F25	689	RU
2	Surface Closer	DC8210 A11 M77	689	RU
1	Perimeter Seals	By the frame manufacturer		OT
2	Sweep	18061CNB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE

Notes: Confirm hardware compatibility with aluminum door manufacturer.

Set: 5.0

Doors: 124.2, 124.3

Description: Sgl - Exterior - ASF - Exit Device-NL- Closer w/Stop Arm

1	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Rim Exit Device, Nightlatch	ED4200 K157ET CT*R M110	630C	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Door Pull	BF157 Mtg-Type 12HD	US32D-MS	RO
1	Drop Plate	754F25	689	RU
1	Surface Closer	DC8210 A11 M77	689	RU
1	Perimeter Seals	By the frame manufacturer		OT
1	Sweep	18061CNB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE

Set: 6.0

Doors: 101.2, 113.1, 122.1, 122.2, S101.1, S102.1

Description: Sgl Exterior - FRP - Rim Exit - Closer w/Stop Arm

1	Continuous Hinge	CFM HD1 x Dr. Ht.		PE
1	Rim Exit Device, Nightlatch	ED5200S L957ET M54 CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8210 A11 M54	689	RU
1	Kick Plate	K1050 10" CSK BEV	US32D	RO
1	Gasketing	2891AS (head & jambs)		PE
1	Rain Guard	346C x Frame Width		PE
1	Sweep	345ANB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE

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Notes: Confirm hardware compatibility with door manufacturer.

Set: 7.0

Doors: 126.1

Description: Sgl Exterior - HM - Storeroom Lock - Closer w/Stop Arm

1	Continuous Hinge	CFM HD1 x Dr. Ht.		PE
1	Storeroom Lock	ML2057 LSM x CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8210 A11 M54	689	RU
1	Kick Plate	K1050 10" CSK BEV	US32D	RO
1	Gasketing	2891AS (head & jambs)		PE
1	Rain Guard	346C x Frame Width		PE
1	Sweep	345ANB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE

Set: 8.0

Doors: 202.1, 208.1

Description: Sgl - ASF - Terrace Exit Device-Classroom

1	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Rim Exit Device, Classroom	ED4200 L855ET CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1	Drop Plate	754F25	689	RU
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
1	Perimeter Seals	By the frame manufacturer		OT
1	Sweep	18061CNB x Dr. Width		PE
1	Panic Threshold	2005AT MSES25SS x Opening Width		PE

Set: 9.0

Doors: 101.1, 101.3

Description: Sgl - Int ASF - AR Deadlatch

1	Continuous Hinge	CFM SLF-HD1 x Dr. Ht.		PE
1	Deadlatch	4900	628	AD
1	Lever Operator	4600 (deadlatches) 02-Round	US32D	AD
1	Deadlatch Lever	3080 02-Round	US32D	AD
1	Interchangeable Core	LFIC 59A1	626	RU
1	Cylinder	Confirm Type - CT*R	630	RU
1	Drop Plate	754F25	689	RU
1	Surface Closer	DC8210 A11 M77	689	RU
1	Perimeter Seals	By the frame manufacturer		OT

Notes: Confirm hardware compatibility with aluminum door manufacturer.

Set: 10.0

Doors: S201.1, S202.1

Description: Single -Open Air Stair - Classroom Exit - Closer - Gasket

1	Continuous Hinge	CFM HD1 x Dr. Ht.		PE
1	Rim Exit, Classroom	ED5200S (A) L955ET M54 CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1	Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
1	Gasketing	2891AS (head & jambs)		PE

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1	Sweep	345ANB x Dr. Width	PE
1	Panic Threshold	2005AT MSES25SS x Opening Width	PE

Set: 11.0

Doors: [109.1](#), [114.1](#)

Description: Single - Storeroom Lock - Closer - Gasket

4	Hinge, Full Mortise	TA2714	US26D	MK
1	Storeroom Lock	ML2057 LSM x CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1	Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
1	Gasketing	S88BL (head & jambs)		PE

Set: 12.0

Doors: [111.1](#)

Description: Single - Storeroom Lock - Closer

4	Hinge, Full Mortise	TA2714	US26D	MK
1	Storeroom Lock	ML2057 LSM x CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1	Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
3	Silencer	608-RKW		RO

Set: 13.0

Doors: [102.1](#), [120.1](#), [125.1](#), [125.2](#)

Description: Single - Storeroom Lock

4	Hinge, Full Mortise	TA2714	US26D	MK
1	Storeroom Lock	ML2057 LSM x CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
3	Silencer	608-RKW		RO

Set: 14.0

Doors: [103.1](#), [104.1](#), [105.1](#), [106.1](#), [107.1](#), [201.3](#), [201.4](#)

Description: Single - Office

4	Hinge, Full Mortise	TA2714	US26D	MK
1	Entrance Lock	ML2053 LSM CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
3	Silencer	608-RKW		RO

Set: 15.0

Doors: [112.1](#), [201.1](#), [201.2](#), [207.1](#), [209.1](#), [212.1](#)

Description: Single -Classroom Lock - Closer - Gasket

4	Hinge, Full Mortise	TA2714	US26D	MK
1	Classroom Lock	ML2055 LSM CT*R	630	RU
1	Interchangeable Core	LFIC 59A1	626	RU
1	Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1	Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1	Door Stop	406 / 441H (as req'd per app)	US32D	RO
1	Gasketing	S88BL (head & jambs)		PE

Notes: 4 1/2" hinge at 3' doors.

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Set: 16.0

Doors: [205.1](#), [206.1](#), [210.1](#), [211.1](#)

Description: Single -Classroom Lock - Closer/stop - Gasket

4 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	ML2055 LSM CT*R	630	RU
1 Interchangeable Core	LFIC 59A1	626	RU
1 Surface Closer	DC8210 A11 M54	689	RU
1 Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Gasketing	S88BL (head & jambs)		PE

Set: 17.0

Doors: [108.1](#), [128.1](#), [203.1](#), [204.1](#)

Description: Single -Interior - Gang RR/Locker - Inswing

4 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
1 Deadbolt	DL4117 CT*R	626	RU
1 Interchangeable Core	LFIC 59A1	626	RU
1 Pull Plate	BF 107x70C	US32D-MS	RO
1 Push Plate	70E	US32D-MS	RO
1 Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
1 Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
1 Door Stop	406 / 441H (as req'd per app)	US32D	RO
1 Gasketing	2891AS (head & jambs)		PE

Set: 18.0

Doors: [124.1](#)

Description: Pr -Interior - Push Pull

8 Hinge, Full Mortise, Hvy Wt	T4A3786	US26D	MK
2 Pull Plate	BF 107x70C	US32D-MS	RO
2 Push Plate	70E	US32D-MS	RO
2 Surface Closer	DC8200/DC8210 M54 (as req'd)	689	RU
2 Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO
2 Door Stop	406 / 441H (as req'd per app)	US32D	RO
2 Silencer	608-RKW		RO

Set: 19.0

Doors: 123.1

Description: Overhead door

1 Interchangeable Core	LFIC 59A1	626	RU
1 Cylinder	Confirm Type - CT*R	630	RU
1 Balance hardware	By the door manufacturer		OT

Notes: Confirm cylinder type required by door manufacturer.

Set: 20.0

Door: 303 (Existing)

Description: Single -Classroom Lock

1 Classroom Lock	ML2004 LSVN V20 CT6R	630	RU
1 Interchangeable Core	LFIC 59A1	626	RU

END OF SECTION

Section 08 80 00 Glazing

Specifications

08 80 00-1

PART 1 GENERAL

1.01 INCLUDES

- A. Glass at Aluminum Entrances and Storefronts, Curtainwalls.

1.02 RELATED SECTIONS

- A. Section 07 90 00 - Joint Sealers: Sealant and back-up material at perimeter of system/installation.
- B. Section 08 41 00 – Aluminum Entrances and Storefront: Entrance doors and surrounding frames to receive glass.
- C. Section 08 44 13 – Glazed Aluminum Curtainwalls

1.03 REFERENCES

- A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
- B. ASTM C804 - Use of Solvent-Release Type Sealants.
- C. ASTM C864 - Dense Elastomeric Compression Seal Gaskets, Setting Blocks.
- D. ASTM E84 - Surface Burning Characteristics of Building Materials.
- E. ASTM E546 - Test Method For Frost Point of Sealed Insulating Glass Units.
- F. ASTM E576 - Test Method For Dew/Frost Point of Sealed Insulating Glass Units.
- G. ASTM E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.
- H. ASTM E774 - Sealed Insulating Glass Units.
- I. FGMA - Glazing Manual.
- J. SIGMA - Sealed Insulated Glass Manufacturers Association.

1.04 PERFORMANCE REQUIREMENTS

- A. Provide glass materials for continuity of building enclosure:
 - 1. In conjunction with materials described in Section 07 90 00.
 - 2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
 - 3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.
- B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC and FGMA code.
- C. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing.

1.05 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data Glazing Compounds: Provide functional, environmental characteristics.
- D. Samples: Submit sample 12 x 12 inch in size, exemplifying glass coloration and design
- E. Warranties: Provide approval sample for all required warranties.

1.06 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Certificates: Certify that Products meet or exceed specified requirements.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with FGMA Glazing Manual and Sealant Manuals.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.
- C. Provide a five (5) year warranty to include faulty tempering for tempered glass.
- D. Thermal insulating units to have a ten (10) year warranty against condensation due to edge seal failure.
- E. Exterior vertical glazing to have two (2) year warranty against leakage.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain ambient temperature before, during and 24 hours after installation

Section 08 80 00 Glazing

Specifications

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PART 2 PRODUCTS

2.01 GLASS MATERIALS

- A. Manufacturers:
 - 1. Basis of Design: Vitro Glass, Solarban 70XL
 - 2. Viracon
 - 3. Guardian
 - 4. Oldcastle.
 - 5. Substitutions: In accordance with Section 01 63 00
- B. Low-E Coating: To achieve performance equal to the Basis of Design.
- C. GL1: Clear, Insulated, Low-E;
- D. GL 2: same as GL-1 but with opaque warm gray ceramic frit on #3 surface
- E. GL 3: same as GL-1, but with tempered glass; required locations by Code.
- F. GL 4: ¼ inch Tempered Safety Glass
- G. Mirror Glass: Guardian UltraMirror; First quality plate glass, with two coats of silver, electrolytically copper clad. Meet or exceed U.S Commercial Standard CS-27-36.

2.02 GLAZING ACCESSORIES

- A. Setting Blocks: Silicone, 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Silicone, 50 to 60 Shore A durometer hardness, min 3 inch long x one half height of glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Clips: Manufacturer's standard type.

2.03 SOURCE QUALITY CONTROL AND TESTS

- A. Test samples in accordance with ANSI Z97.1, ASTM E773, ASTM E546,ASTM E576.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Apply glazing in accordance with framing system manufacturer's recommendation.

3.04 CLEANING

- A. Remove glazing materials from finish surfaces and labels after Work is complete.
- B. Clean glass and adjacent surfaces; protect installed work.

END OF SECTION

Section 09 29 16 Gypsum Board Assemblies

Specifications

09 29 00-1

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Metal stud framed interior partitions and exterior assemblies
- B. Direct-hung steel ceiling grid.
- C. Metal stud ceiling framing
- D. Metal stud soffit framing and bracing.
- E. Taped and sanded joint treatment.
- F. Expansion controls, corner edges and beads.
- G. Gypsum wallboard installation
- H. Exterior sheathing
- I. Gypsum Shaft Liner and CH Studs
- J. Impact Resistant Gypsum Panels
- K. Cement Tile Backer Board.
- L. Manufacturer's (delegated) design: stud gauge, stud sizes, stud spacing, and bracing.

1.02 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking for support of misc. items.
- B. Section 07 21 00 - Insulation: Thermal insulation, also used for sound attenuation.
- D. Section 09 90 00 – Painting and Coating: Surface finish.
- E. Section 08 31 00 - Access Doors and Panels

1.03 REFERENCES

- A. ASTM C79 – Test Method for Gypsum Sheathing Board
- B. ASTM C473 – Test Methods for Physical Testing of Gypsum Panel Products.
- C. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
- D. ASTM C514 - Nails for the Application of Gypsum Wallboard.
- E. ASTM C630 – Specifications for Water Resistant Gypsum Backing Board.
- F. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- G. ASTM C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- H. ASTM C840 - Application and Finishing of Gypsum Board
- I. ASTM C 954 – Standard Specifications for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs..
- J. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.
- K. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- L. ASTM C 1177 –Specification for GlassMat Gypsum Substrate for Use as Sheathing.
- M. ASTM C1280 – Specification for Application of Gypsum Sheathing
- N. ASTM C1396 – Standard Specification for Gypsum Wallboard.
- O. GA-201 - Gypsum Board for Walls and Ceilings.
- P. GA – 214 – Recommended Specifications: Levels of Gypsum Board Finish.
- Q. GA-216 - Specifications for the Application and Finishing of Gypsum Board.
- R. FS SS-L-30 – Federal Specification

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Provide data on metal framing, gypsum board, and joint tape.
- C. Calculations for delegated design of stud gauges, sizes.
- D. Details of any required overhead bracing necessary for spans.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GA-201, GA-216 and GA-600, and all Standard References noted this Section, as applicable; note that reference to specific individual

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provisions and standards (of the GA specifications) elsewhere in this Section does not exclude the requirement for compliance with all the applicable provisions of the GA specifications.

1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

1.07 PERFORMANCE REQUIREMENTS

- A. Design steel studs in accordance with the manufacturer's standard load tables and following design pressures and deflections:
 - 1. All partitions: L/240 at 5 psf.
 - 2. Partitions with Tile finish: L/360.

1.08 WARRANTY

- A. Warrant the work specified for one year against becoming unserviceable or causing an objectionable appearance resulting from either defective or nonconforming materials or workmanship.
- B. In addition, provide warranty from the manufacturers for the following products:
 - 1. Exterior sheathing weathering warranty covering in-place exposure damage to exterior sheathing for twelve months.
 - 2. Exterior sheathing warranty against manufacturing defects for five years.
 - 3. Impact Resistant Panel warranty against manufacturing defects for (5) years.
 - 4. Cement Tile Backer warranty against manufacturing defects for 20 years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - GYPSUM BOARD SYSTEM

- A. United States Gypsum Company
- B. Other acceptable manufacturers offering equivalent products
 - 1. National Gypsum
 - 2. Temple Inland
 - 3. Substitutions: In accordance with Section 01 63 00
- C. Manufacturers of Metal Studs (In addition to manufacturers noted above):
 - 1. ClarkDietrich Building Systems
 - 2. MarinoWare
 - 3. Steel-Con Steel Construction Systems
 - 4. Substitutions: In accordance with Section 01 63 00

2.02 MATERIALS

- A. Metal Framing System:
 - 1. Studs:
 - a. Meeting requirements of ASTM C645-08; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating. Channel type screw studs roll formed from 20 gauge/33 mil galvanized steel, unless otherwise shown on drawings. Provide channel type screw studs roll formed from 20 gauge (1/360) galvanized steel at walls to receive tile.
 - b. Widths shall be as indicated on drawings.
 - c. Section modulus for studs shall be S = 0.135 for 3-5/8 inch studs, and S = 0.082 for 2-1/2 inch studs.
 - 2. Tracks:

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- a. Meeting requirements of ASTM C645-08; C-channel, roll-formed from hot-dipped galvanized steel; complying with ASTM A1003 and ASTM A653 G40 or equivalent corrosion resistant coating
 - b. Widths shall be as indicated on drawings.
 - c. Deflection Track (DT) (Non-rated walls): Use deflection track at walls extending to structure to allow for movement. Deflection track shall allow 1/2 inch movement. Do not fasten studs directly to Deflection Track.
 - d. Deflection Track and Firestop System (At fire rated walls): General Contractor shall use a deflection track and firestop system at heads of fire rated partitions. System shall use "Shadowline" deflection track, mineral fiber, sealant, clips, and accessories required to achieve fire ratings shown or required by authorities having jurisdiction. System shall comply with Deflection Track and Firestop System manufactured by Fire Trak Corp., Kimball, MN; (800) 394-9875, Dietrich Metal Framing; SLP-TRK® Slotted Deflection Track by Brady Innovations or equal or comparable products manufactured by The STEEL Network, Inc., Raleigh, NC; (919) 845-1025, or Project Manager approved equal.
 - e. Channel Bridging and Bracing: U-Channel Assembly; Base metal thickness of .0538 inch (1.37mm) and minimum 1/2 inch wide flanges.
 - f. FLAT STRAP AND BACKING PLATE: Sheet for blocking and bracing in length and width indicated:
 - a. Subject to compliance with requirements, provide Dietrich Metal Framing: Danback™ Fire Treated Wood Backing Plate
 - b. Galvanized Sheet Steel.
3. Comply with applicable reference standards.
4. Refer to Section 05 40 00 for light gauge steel framing for 18 gauge and heavier runners and other framing as shown or required.
- B. Drywall Suspension System (If shown or required): Pre-engineered drywall suspension system specially created to simplify the design and construction of flat drywall ceilings. Approved Product/Manufacturer: USG Drywall Suspension System manufactured by USG Interiors, Inc., or approved equal.
- C. Wall and Ceiling Materials:
 1. Exterior Sheathing: ASTM C1177; 1/2 inch thick water resistant treated gypsum core, glass mats both front and back faced or embedded in core, weather resistant surface, zero flame spread, zero smoke developed. Approved Product/Manufacturer: "Dens-Glass Exterior Sheathing" manufactured by Georgia-Pacific; "GlasRoc" manufactured by CertainTeed; "Securock" manufactured by USG; "Gold Bond e²XP" manufactured by National Gypsum. Use as exterior sheathing in metal stud framed construction behind face brick in cavity wall construction, and behind plaster.
 2. Gypsum Wallboard:
 - a. Wallboard: 5/8 inch thick, tapered-edged, conforming to ASTM C1396, Type X. Sizes shall be 4 feet-0 inches wide by longest practical length to minimize joints.
 - b. Moisture Resistant: 5/8 inch thick, moisture resistant (MR), green faced, tapered-edged, conforming to ASTM C1396. Sizes shall be 4 feet-0 inches wide by longest practical length to minimize joints. Provide fire rated core where required to maintain fire rating of adjacent assembly.

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3. Abuse Resistant Gypsum Panel (Heavy Duty): 5/8 inch thick, Type X, with tapered edge, "DensArmor Plus Impact Resistant Panel" manufactured by G-P Gypsum Corp, "Fiberock VHI" manufactured by USG Corporation, "Hi-Impact XP Wallboard" manufactured by National Gypsum Company, or approved equal. Use everywhere in project to 8' height, unless noted otherwise.
4. Gypsum Shaft Liner Panels and Stud Framing: One (1) thick gypsum core for added fire resistance and multi-layered green paper facings that are treated to resist moisture penetration; CH metal studs, complete with jamb struts; UL 469, System A Assembly.
5. Cement Tile Backer Board (Wet areas): 5/8 inch thick, "G-P Dens-Shield Tile Guard", Bonsal "Util-A-Crete", "USG Durock", "Wonderboard", "National Gypsum Permabase", or Project Manager approved equal. Use as sheathing at shower areas and restrooms, or as scheduled on walls to receive ceramic tile in other wet areas. Use greatest width by longest practical length to minimize joints. Use joint reinforcement and fasteners in accordance with manufacturer's printed instructions. For fiber and cement backer boards, provide waterproof membrane behind backer board per TCA W244. Coated glass-mat water-resistant gypsum board does not require waterproofing membrane per TCA W245.
7. Moisture Resistant Tile Backer Board (Dry areas): 5/8 inch thick, "FiberockBrand 'Aqua-Tough' Gypsum Interior Panels" as manufactured by USG Corporation; "DensArmor Interior Guard Plus" manufactured by G-P Gypsum Corp, or Project Manager approved equal.
8. Channels: 16 gauge cold formed steel channels with hot dip galvanized finish. Sizes as indicated on drawings. Use for suspended ceilings and elsewhere as indicated.
9. Furring Channels: Standard 2-3/4 inches wide, 7/8 inch deep galvanized sheet metal furring channel.
10. Corner Beads: No. 28 gauge galvanized steel, 1-1/4 inch legs. Use at all exterior corners.
11. Joint Compound: Standard types manufactured by gypsum wallboard manufacturer for intended use. Fire rated type must be used on fireproof systems. Perlite and other additives not permitted.
12. Laminating Adhesives: Standard type manufactured or recommended by manufacturer of product to be laminated; ASTM C 557
13. Acoustic Sealant: Single component, non-skinning, non-hardening synthetic rubber for use in the acoustical sealing of gypsum board partitions. STC rating as required by drawings in accordance with manufacturers instructions to achieve rating. Approved Products and Manufacturers: Tremco Acoustical Sealant manufactured by Tremco Sealant/Weatherproofing Division, Beachwood, OH; (800) 321-7906, or Project Manager approved equal.
14. Ceiling Hanger and Tie Wire: 9-gauge galvanized hanger wire and 16 gauge tie wire.
15. Screws: One (1) inch and 1-5/8 inch long self drilling, self tapping cadmium plated bugle head type. Comply with applicable reference standards.
16. Resilient Clips: Standard type for resilient installation in accordance with wallboard manufacturer's recommendations.
17. Control Joints: Metal (USG #093 / Dietrich 093 Control Joint) type with 1/4 inch open joint, perforated flanges for floating in place.

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18. Wall Fixture Reinforcement: 6 inches, 14 gauge cold formed steel galvanized channels.
19. Glass-fiber Mesh Tape: minimum 2 inch wide self-adhering glass-fiber type, 10X10 threads per inch.
20. Silicone Joint Sealant: ASTM C920, Type S, grade NS, compatible with exterior sheathing tape and sheathing, instructed by tape and sheathing manufacturers for use with glass-fiber mesh sheathing tape and for covering exposed fasteners.
21. Waterproof membrane under cementitious/fiber tile backer board shall be minimum 15-pound building felt or 4-mil polyethylene film in accordance with ANSI A2.1.8.
22. Edge Trim/J-Mold: GA-216, type LC bead.
23. Control Joints: Equal to USG No. 093
24. Reveal Trim: Equal to Trim-Tex Architectural Reveal Bead - AS 5/8" x 1/2" Reveal
25. Shadow Bead: Equal to Trim-Tex Architectural Z Shadow Bead - AS 5/8" x 1/2" Z Shadow
26. Provide/install access panels (Section 08 31 00) as needed to facilitate equipment maintenance and access valves that are located behind work of this section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work.

3.02 EXTERIOR SHEATHING INSTALLATION

- A. Furnish exterior sheathing where indicated on drawings and install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253 and ASTM C1280, without openings, gaps, cracks, or holes.
- B. Attach sheathing to metal framing with gold side out and with screws spaced eight (8) inches on center at perimeter where there are framing supports and eight (8) inches on center along intermediate framing in field.
- C. Use maximum lengths possible to minimize number of joints.
- D. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
- E. Locate fasteners minimum 3/8 inch from edges and ends of sheathing panels.
- F. Apply continuous dampproofing as specified in Section 07 11 00, Dampproofing Above Grade. Prep exterior sheathing per manufacturer's instructions.

3.03 INTERIOR METAL FRAMING INSTALLATION

- A. Steel Framing Installation Standard: Comply with ASTM C754.
- B. Floor Track: Attach to floor at 24 inches maximum centers with shoot-in pins or concrete nails.
- C. Ceiling Track: Fasten at 24 inch intervals, staggered. Where shown or required to extend above ceiling, brace to the structure at intervals not exceeding 4 feet.
- D. Deflection Track (DT): Deflection track shall allow 1/2 inch movement. Do not fasten studs directly to Deflection Track. At fire rated walls, General Contractor shall use the specified deflection track with firestop systems.
- E. Drywall Suspension System: Use at gypsum drywall suspended ceilings, where shown or required.
- F. Metal Studs:

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1. Single lengths positioned vertically straight and plumb in the runners, spaced 16 inches on center, unless shown otherwise on drawings.
 2. Anchor all studs located adjacent to door and window frames, partitions intersections and corners to runner flanges by positive screw engagement through each stud flange and runner flange.
 3. Position all studs vertically with the open side facing in the same direction, engaging the floor and ceiling runners.
 4. Use positive screw attachments with 3/8 inch or 1/2 inch Type "S" or "S-12" pan head screws through each stud flange and runner flange.
 - G. Fixture Reinforcement: Provide solid bridging spanning between wall studs at all wall mounted fixtures, finish hardware, toilet partitions, accessories and equipment.
 - H. Shaftwall Installation: Install with all reinforcing and assembly required by manufacturer's instructions.
- 3.04 GYPSUM WALLBOARD INSTALLATION
- A. Apply all ceiling boards first as described below. Cut boards so that they slip easily into place. Butt all joints loosely. Never force panels into position. Place tapered or wrapped edges next to one another.
 - B. Select the maximum practical length to minimize end joints. All end joints shall be neatly fitted and staggered. Joints on opposite sides of partition shall be so arranged as to occur on different studs.
 - C. Never place a butt end or a cut edge next to a tapered or rounded edge. Wherever possible, apply boards perpendicular to framing and in lengths that will span ceilings and walls without creating end (butt) joints. If butt joints do occur, stagger and locate them as far from the center of walls and ceilings as possible.
 - D. Support all ends and edges of gypsum board on framing, except long edges at right angles to framing and where end joints are to be floated between frame members and back-blocked.
 - E. When fastening, apply hand pressure on panel next to fastener being driven to insure panel is in tight contact with framing member.
 - F. Install metal corner bead at external corners. Where length of the corner does not exceed standard stock lengths, use a single length.
 - G. Install gypsum board 1/2 inch above surface of slab to prevent wicking of moisture.
 - H. Install metal trim where indicated.
 - I. To insure level surfaces at joints, arrange board application so that the leading edge of each board is attached to the open or unsupported edge of a steel stud flange. To do this, all studs must be placed so that their flanges point in the same direction. Board application is then planned to advance in the direction opposite to flange direction.
 - J. Leading edge of gypsum board shall not be attached to the web edge of a flange.
 - K. Fasten wallboard at 12 inches on center except at the edges/joints which shall be at 8 inches on center
 - L. Edge-Grip Clips: Position clips on the back of the panels and drive prongs into panel edges. Space clips 16 inches on center Screw-attach clip to framing, furring or wall surface.
 - M. Finishing: Level 4 Finish at all exposed areas.
 1. Apply at least two (2) coats of joint compound over beads, screw heads and trim, and each coat shall be feathered out onto panel faces.
 2. Float out and sand joints to make joints invisible when painted with non-texture paint.
 - N. Caulk around pipes, ducts, structure or similar items which penetrate drywall.
 - O. Provide acoustical sealant at walls in accordance with manufacturer's instructions.

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- P. Control joints shall be located 30 feet-0 inches on center maximum and along building expansion joints, unless noted otherwise on drawings. Locations shall be reviewed with Project Manager prior to final placement.
- 3.05 CEMENT TILE BACKER BOARD INSTALLATION – WET AREAS
 - A. Install tile backer on walls vertically or horizontally.
 - B. Coated Glass Mat Backer Boards: Install tile backer directly on metal stud framing system in showers and other wet areas in accordance with manufacturer's recommendations and TCA, Methods W245 at walls and B420 for shower installations.
 - C. Cementitious/Fiber Backer Boards: Install tile backer on approved waterproof membrane in showers and other wet areas in accordance with manufacturer's recommendations and TCA, Method W244 at walls, B419 for shower installations.
 - D. Finishing:
 - 1. Substrate for tile: Apply clear silicone sealant to corners and board joints. Apply glass mesh joint tape over joints. Embed tape in setting material specified for tile finishes. Seal penetrations with setting material or silicone sealant. Allow joints and penetrations to dry prior to installing tile systems.
- 3.06 GYPSUM SHAFT LINER INSTALLATION
 - A. Install in accordance with manufacturer's instructions.
 - B. Install at locations shown or scheduled on drawings.
- 3.07 ABUSE RESISTANT GYPSUM PANEL INSTALLATION
 - A. Install in accordance with manufacturer's instructions.
 - B. Install at locations shown or scheduled on drawings.
 - C. Scheduled installation areas/rooms: refer to plans.
- 3.08 CEILING FRAMING INSTALLATION
 - A. Main Runners: 9-gauge hanger wires shall be spaced not over 4 feet-0 inches in the direction of 1-1/2 inch main runner channels and not over 4 feet-0 inches in the direction of right angles to the main runners, and within 6 inches of the ends of main runners and of boundary walls, girders or similar interruptions of ceiling continuity. Do not hang wire supports from metal deck unless directed to do so by Project Manager or Structural Engineer. Main runners shall be spaced not over 4 feet-0 inches on center.
 - B. Cross tees shall be spaced in accordance with manufacturer's recommendations or in conformance with UL Fire Resistance Directory.
 - C. Furring Channels: Space 16 inches on center, and saddle-tie with two strands of 16-gauge tie wire to main runners or main support members. Do not let into or come in contact with abutting masonry walls. End splices shall be provided by nesting channels or studs no less than 8 inches and securely wire-tie.
 - D. Drywall Suspension System: Install where indicated in accordance with manufacturer's instructions.
 - E. Provide control joints in ceiling at maximum 30 feet on center and, if possible, to coincide with expansion joints in the roof above.
- 3.09 CEILING BOARD INSTALLATION
 - A. Apply gypsum board of maximum practical length with the long dimension at right angles to the furring channel and fastened with one (1) inch drywall screws spaced 12 inches on center in the field of the board and along abutting ends.
 - B. Align abutting end or edge joints over the web surface of the furring channel. Tie neatly and accurately with end joints staggered.
 - C. Install gypsum board ceiling panels in drywall suspension system.

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3.10 WORKMANSHIP TOLERANCES

- A. Visual: Correct any nicks, bumps, out-of-level or out - of-plumb areas detectable to the naked eye.
- B. Walls: 3/8 inch maximum deviation from vertical.
- C. Bumps in Boards: Maximum 1/8 inch in 24 inches.
- D. Corners: Maximum out-of-square 1/8 inch in 16 inches.
- E. Float solid between corner beads less than 36 inches apart. Surfaces that appear concave are not acceptable.
- F. Provide "J" mold and continuous 1/4 inch reveal wherever gypsum board directly abutts other material or when end is exposed.
- G. Float Control Joints flush with wall surface so that ceiling wall mold specified separately will align with wall surface flat and straight.

3.11 COMMENCEMENT RESTRICTIONS

- A. Interior gypsum wallboard and ceiling board installation may not commence until all exterior dampproofing and roofing are completed and roof top equipment is fully installed and flashed and exterior wall openings are protected.

3.12 ACCESSORIES INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use metal corner reinforcement at all external corners.

3.13 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- C. Prepare backer board joints as recommended by board manufacturer at tile locations.
- D. Finish on interior gypsum to be painted shall be "smooth".
- E. Install control joints on uninterrupted spans of gypsum board at a minimum of every 30'. Install gypsum control joints above vertical interruptions including, but not limited to the following:
 - 1. Above both sides of door openings
 - 2. Above and below window openings.

END OF SECTION

Section 09 30 13

Ceramic Tiling

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceramic mosaic tile.
 - 2. Glazed wall tile.
 - 3. Waterproof membrane.
 - 4. Crack isolation membrane.
 - 5. Metal edge strips.
- B. Related Requirements:
 - 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
 - 2. Section 09 29 16 "Gypsum Board Assemblies" for cementitious backer units.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
 - 1. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

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1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of each type of floor tile installation.
 - 2. Build mockup of each type of wall tile installation.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish [tile] from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Waterproof membrane.
 - 2. Crack isolation membrane.
 - 3. Cementitious backer units.
 - 4. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.

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- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Ceramic Mosaic Tile Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes.
 - 1. Base Cove: Cove, module size.
 - 2. Base Cap for Thin-Set Mortar Installations: Surface bullnose, module size.
 - 3. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size.
 - 4. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size.
 - 5. Internal Corners for Thin-Set Mortar Installations: Module size.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Thresholds and Tile Edge Protection Strips:
 - 1. Schluter-SCHIENE-E, stainless steel.
 - 2. Schluter-RENO-U-E, brushed stainless steel.
 - 3. Schluter-QUADEC, stainless steel.
 - 4. Schluter-RENO-TK, stainless steel.

2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fluid-Applied Membrane: Elastomeric polymer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Bonsal American, an Oldcastle company.
 - c. Custom Building Products.
 - d. LATICRETE SUPERCAP, LLC.
 - e. MAPEI Corporation.
 - f. Southern Grouts & Mortars, Inc.

2.6 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

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- C. PVC Sheet: PVC heat-fused on both sides to facings of nonwoven polyester; 0.040-inch nominal thickness.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
- E. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.

2.7 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Summitville Tiles, Inc.
 - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Summitville Tiles, Inc.
 - 2. Polymer Type: styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
- B. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. Summitville Tiles, Inc.
 - 2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

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- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
 - 1. Schluter-SCHIENE-E, stainless steel.
 - 2. Schluter-RENO-EUGB, brushed stainless steel.
 - 3. See drawings for other tile accessories.
 - C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
 - D. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; CeramaSeal Silox 8.
 - b. Custom Building Products; Surfaceguard Sealer.
 - c. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
 - d. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
- 2.10 MIXING MORTARS AND GROUT
- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - B. Add materials, water, and additives in accurate proportions.
 - C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

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- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors consisting of tiles 8 by 8 inches or larger.
 - f. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Metal Edge Strips: Install [at locations indicated] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated].
- J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

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3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Ceramic Tile Installation: TCNA F113; thinset mortar.
 - a. Ceramic Tile Type: Unglazed ceramic mosaic tile.
 - b. Thinset Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified unsanded grout.
 - 2. Ceramic Tile Installation: TCNA F122; thinset mortar on waterproof membrane.
 - a. Ceramic Tile Type: Unglazed ceramic mosaic tile.
 - b. Thinset Mortar: Latex- portland cement mortar.
 - c. Grout: High-performance unsanded grout.
- B. Interior Wall Installations, Masonry or Concrete:
 - 1. Ceramic Tile Installation: TCNA W202; thinset mortar.
 - a. Ceramic Tile Type: Mosaic.
 - b. Thinset Mortar: Latex- portland cement mortar.
 - c. Grout: High-performance unsanded grout.
 - 2. Ceramic Tile Installation: TCNA W211 and ANSI A108.1A; cement mortar bed (thickset) bonded to substrate.
 - a. Ceramic Tile Type: Mosaic.
 - b. Bond Coat for Wet-Set Method: Latex- portland cement mortar.
 - c. Grout: High-performance unsanded grout.
 - 3. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.

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- a. Ceramic Tile Type: Mosaic.
- b. Thinset Mortar: Latex- portland cement mortar.
- c. Grout: High-performance unsanded grout.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Related Requirements:
 - 1. Section 09 0500 "Finish Key."
 - 2. Section 09 0510 "Finish Schedule."
 - 3. Section 09 5133 "Acoustical Metal Pan Ceilings."
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Size and location of initial access modules for acoustical panels.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - 5. Perimeter moldings.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

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1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.
 - 4. Impact Clips: Equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

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- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
 - F. See Section 09 0500 "Finish Key" for types, patterns and sizes.
- 2.3 METAL SUSPENSION SYSTEMS, GENERAL
- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
 - 1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
 - B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
 - C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
 - D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
 - E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
 - F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.
 - G. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
 - H. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- 2.4 METAL EDGE MOLDINGS AND TRIM
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Chicago Metallic Corporation.
 - 3. Fry Reglet Corporation.
 - 4. Gordon, Inc.
 - 5. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

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1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Profiles:
 - a. Armstrong, "Axiom" knife-edge ceiling perimeter trim.
 - b. Armstrong, "Axiom" perimeter pocket trim.
 - c. Armstrong, "Axiom" Classic straight trim.
 2. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 3. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
- 2.5 ACOUSTICAL SEALANT
- A. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 2. Acoustical Sealant for Concealed Joints:
 - a. Pecora Corporation; AIS-919.
 - b. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
 2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
- 2.6 EXAMINATION
- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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2.7 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

2.8 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:

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- a. As indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down and impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

2.9 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 1. Compliance of seismic design.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

2.10 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

Section 09 54 60

Linear Felt Ceilings

Specifications

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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. LEED Data: www.ecoscorecard.com
 - 2. Non-perforated felt ceiling panels
 - 3. Suspension systems
 - 4. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, wall angles, and other devices required for a complete installation.
 - 5. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support direct-hung felt ceilings suspension system.
- B. Related Sections / Work:
 - 1. Sections 05 40 00 – Cold-Formed Metal Framing
 - 2. Sections 09 20 00 – Plaster and Gypsum Board
 - 3. Sections 09 50 00 – Acoustical Ceilings
 - 4. Sections 09 90 00 – Paintings and Coatings
 - 5. Division 23 – Heating, Ventilating and Air Conditioning
 - 6. Division 26 – Electrical
- C. This Section covers the general requirements only for Acoustical Felt Ceilings as shown on the drawings. The supplying and installation of additional accessory features and other items not specifically mentioned herein, but which are necessary to make a complete installation, shall also be included or clarified accordingly.
- D. Qualification Data:
 - 1. Test Reports: Certified reports from independent agency substantiating structural compliance to governing code requirements.
 - 2. Certificates:
 - a. Data substantiating manufacturer and installer qualifications.
 - b. Certified data attesting fire rated materials comply with specifications.
 - 3. Manufacturer's Instructions: Detailed installation instructions and maintenance data.

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Linear Felt Ceilings

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1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. E 84 – "Standard Test Method for Surface Burning Characteristics of Building Materials"
 - 2. E 488 – "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements"
 - 3. B 209 – "Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate"
 - 4. C 423 – "Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method"
 - 5. E 580 – "Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint"
 - 6. C 635 – "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings"
 - 7. C 636 – "Recommended Practice for Installation of Metal Ceiling Suspensions Systems for Acoustical and Lay-in Panels"
 - 8. A 641 – "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"
 - 9. A 653 – "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip process"
 - 10. E 1264 – "Classification for Acoustical Ceiling Products"
 - 11. E 1477 – "Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by use of Integrating-Sphere Reflectometers"
 - 12. D 1044 – "Practice for Abrasion Resistance"
 - 13. D 1002 – "Practice for Adhesion Resistance"
- B. Cradle-to-Cradle Bronze Certified
- C. LEED-CI 2009: Applicable LEED Environmental Categories and Credits and performance requirements as indicated in LEED for Commercial Interiors 2009:
 - 1. Material and Resources (MR)
 - a. MRc4 – Building Product Disclosure and Optimization – Material Ingredients
 - 2. Indoor Environmental Quality (IEQ)
 - a. IEQc4.6 – Low-Emitting Materials – Ceiling and Wall Systems
 - b. IEQpc24 – Acoustics
- D. LEED v4 ID+C: Applicable LEED v.4 Environmental Categories and Credits and performance requirements as indicated in LEED v4 for Interior Design + Coordination:
 - 1. MR Credit: Building Product Disclosure & Optimization – Material Ingredients
 - 2. EQ Credit: Low-Emitting Materials

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Linear Felt Ceilings

Specifications

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3. EQ Credit: Indoor Air Quality Assessment
4. EQ Credit: Acoustic Performance

1.4 SUBMITTALS

- A. Product Data: Manufacturer's published literature, including specifications.
- B. LEED Submittal Data: Manufacturer's product data for each product specified in this section per ecoscorecard.com.
- C. Product Certification: Manufacturer's certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.
- D. Shop Drawings: Submit shop drawings for reflected ceiling plans (RCP's), drawn to scale, and indicating penetrations and ceiling mounted items. Show the following details:
 1. Reflected Ceiling Plan(s): Indicating felt ceiling layout, ceiling mounted items and penetrations.
 2. Suspension System, Carrier and Component Layout.
 3. Details of system assembly and connections to building components.
- E. Samples for Verification: Full-size units (or as specified below) of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.
 1. 11" long felt panel units.
 2. 11" long samples of each suspension component.

1.5 QUALITY ASSURANCE

- A. Manufacturer/Installer Qualifications:
 1. Provide felt ceiling system and suspension system components produced by a single manufacturer to provide consistent quality in appearance and physical properties, without delaying the work.
 2. Perform installations using a firm with installers having no less than 3 years of successful experience on projects of similar size and requirements.
- B. Regulatory Requirements:
 1. Fire Rating Performance Characteristics: Install system to provide a flame spread of 0 - 25, complying with certified testing to ASTM E 84.
 2. Structural Criteria: Install and certify system to comply with structural and wind load requirements of governing codes.
 3. Installation Standard for Suspension System: Comply with ASTM C 636.
- C. Pre-installation Conference: Conduct a conference, prior to start of installation, to review system requirements, shop drawings, and all coordination needs.

1.6 DELIVERY, STORAGE AND HANDLING

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Linear Felt Ceilings

Specifications

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- A. Deliver system components in manufacturer's original unopened packages, clearly labeled.
- B. Store components in fully enclosed dry space. Carefully place on skids, to prevent damage from moisture and other construction activities.
- C. Handle components to prevent damage to surfaces and edges, and to prevent distortion and other physical damage.

1.7 PROJECT CONDITIONS

- A. Begin system installations only after spaces are enclosed and weather-tight, and after all wet work and overhead work have been completed.
- B. Prior to starting installations, allow materials to reach ambient room temperature and humidity intended to be maintained for occupancy.

1.8 WARRANTY

- A. Provide specified manufacturer's warranty against defects in workmanship, discoloration, or other defect considered undesirable by the Architect or Employer.
- B. This warranty shall remain in effect for a minimum period of one (1) year from date of initial acceptance.

1.9 MAINTENANCE & EXTRA MATERIALS

- A. Maintenance Instructions: Provide manufacturer's standard maintenance and cleaning instructions for finishes provided. Given the unique and special nature of our HeartFelt™ ceiling product, steps should be taken (before and during installation, as well as over the lifetime of the ceiling) to avoid or minimize static and the accumulation of dust, lint, dirt or airborne particles on or around the felt. Hunter Douglas does not warrant against or take responsibility for any such static or accumulation.
- B. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Only typical system components are included with attic stock.
 - 1. Acoustical Felt Ceiling Pan Units: Full-size units equal to two percent (2%) of amount installed.
 - 2. Ceiling Suspension System Components: Quantity of each grid and exposed component equal to two percent (2%) of amount installed.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Provide HeartFelt™ linear felt panel ceiling and wall system manufactured by Hunter Douglas exclusively supplied from CertainTeed Architectural; 5015 Oakbrook Parkway, Suite 100, Norcross, GA 30093. Tel: (800) 366-4327; www.CTSpecialtyCeilings.com

Heartfelt™ is a trademark of Hunter Douglas Inc. used with permission

- B. Acceptable Manufacturers:
 - 1. USG: Paraline Linear Baffles System

2.2 SYSTEM MATERIALS

- A. Linear felt panel ceiling system for interior installations:

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- B. Panel Profile Type: .090" thick PES (polyester) felt with square edges.
 - 1. Panel Profile: (1-9/16"(40mm) wide x 2-3/16"(55mm) deep profile), (1-9/16" (40mm) wide x 3-1/8" (80mm) deep profile), (1-9/16" (40mm) wide x 4-1/8" (105mm) deep profile)
 - 2. Carrier Module: 2-3/8"; 60mm, 3-1/8"; 80mm, 3-15/16"; 100mm module. Reveal varies with carrier module selected.
 - 3. Panel length: (*Standard 96"*)
- C. Panel Profile Type: .090" thick PES (polyester) felt with round edge.
 - 1. 1-9/16" (40mm) wide x 2-1/2" (64mm) deep profile.
- D. Panel length: (*Standard 96"*)
- E. Linear Suspension System:
 - 1. Carrier: Roll-formed aluminum section with hook-shaped tabs spaced to receive ceiling panels. Finish: (*black – factory-applied enamel*). Carrier types: Standard, Levels
 - a.

Standard Carrier:

designed for HeartFelt panels with the same elevation. Roll-formed aluminum section with hook-shaped tabs spaced to receive ceiling panels. All tabs at the same height for Ceiling panel to remain on same plain. Finish: (*black – factory-applied enamel*).
 - b.

Levels Carrier: designed

for HeartFelt *Levels* with varying elevations. Roll-formed aluminum section with hook-shaped tabs spaced to receive ceiling panels, tabs at varies depth and spacing specified. Finish: (*black – factory-applied enamel*).

Standard Levels Carriers include: Wave, Choppy, Step, Scatter
 - 2. Hangers:
 - a. Hanger Wire: 12 gage galvanized carbon steel hanger wire.
 - b. Threaded Rod
 - c. Aircraft Cable
 - 3. Seismic Compression Struts: 1-1/2" (38 mm) deep, 16 Ga., cold-rolled steel "C" channels.
- F. Perforations: Non-perforated only
- G. Panel Finish:
 - 1. HeartFelt Greys (all square edge and round edge profiles)
 - a. White 7593F
 - b. Light Grey 7596F
 - c. Middle Grey 7597F
 - d. Dark Grey 7598F

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Linear Felt Ceilings

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- e. Black 7594F
- 2. HeartFelt Earth Tones (square edge 1-9/16" (40mm) wide x 2-3/16" (55mm) deep profile)
 - a. Crème 7575F
 - b. Light Brown 7576F
 - c. Medium Brown 7577F
 - d. Dark Brown 7578F
 - e. Umber 7579F

2.3 ACCESSORY MATERIALS

- A. Panel Splice: Formed aluminum insert designed to slide into and bite into ends of two ceiling panels.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical felt panels attach or abut, with installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of felt panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Measure each ceiling area and establish layout of acoustical felt pan units to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.
- C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.3 INSTALLATION

- A. General: Install acoustical felt pan ceilings, per manufacturers shop drawings provided, per manufacturer's written instructions and to comply with publications referenced below.
 - 1. CISCA "Ceiling Systems Handbook"
 - 2. Standard for Ceiling Suspension System Installations - ASTM C 636
 - 3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E 580
 - 4. IBC (International Building Code) Standard for Seismic Zone for local area
- B. Suspend ceiling hangers from building's approved structural substrates and as follows:

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Linear Felt Ceilings

Specifications

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1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produce hanger spacings that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Utilize supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Where used secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Space hangers not more than 48" on-center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 12" from ends of each member. Supply supporting calculations from licensed Structural Engineer verifying hanger spacing meets all requirements, when spacing exceeds those recommended.
 6. Level grid to 1/8" in 10' from specified elevation(s), square and true.
 7. Adjust suspension system runners so they are square (within .5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- C. Secure bracing wires to ceiling suspension members and to supports acceptable to Architect/Engineer and/or inspector. Suspend bracing from building's structural members and/or structural deck, as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs (unless directed otherwise).
- D. Scribe and cut acoustical felt panel units for accurate fit at penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled felt sheet.
- E. Install acoustical felt panel units in coordination with suspension system. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.

3.4 ADJUST AND CLEAN

- A. Adjust components to provide uniform tolerances.
- B. Replace all ceiling panels that are creased, faded, or otherwise damaged.
- C. Clean exposed surfaces with vacuum or dusting. If necessary, panels can be wet cleaned with water, or non-solvent, non-abrasive commercial type cleaner.

END OF SECTION

Section 09 65 19 Resilient Tile Flooring

Specifications

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PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
 - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
 - A. Section Includes:
 - 1. Vinyl composition floor tile.
 - B. Related Sections:
 - 1. Section 09 68 13 Tile Carpeting
- 1.3 ACTION SUBMITTALS
 - A. Product Data: For each type of product.
 - B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
 - C. Samples: Full-size units of each color and pattern of floor tile required.
 - D. Samples for Initial Selection: For each type of floor tile indicated.
 - E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
 - F. Product Schedule: For floor tile. Use same designations indicated in Section 09 0500 "Finish Key."
- 1.4 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For Installer.
- 1.5 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For each type of floor tile to include in maintenance manuals.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
 - A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
- 1.7 QUALITY ASSURANCE
 - A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.
 - B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

Section 09 65 19 Resilient Tile Flooring

Specifications

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1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.

2.2 VINYL COMPOSITION FLOOR TILE

- A. Basis-of-Design: Subject to compliance with requirements, provide product indicated in the Drawings or comparable product by an approved manufacturer:
- B. Tile Standard: ASTM F 1066, Class 1, solid-color tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: As indicated in the Drawings

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

Section 09 65 19 Resilient Tile Flooring

Specifications

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- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

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Resilient Tile Flooring

Specifications

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3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 - 1. Sealer: Apply two base coats of liquid sealer.
 - 2. Finish: Apply two coats of liquid floor finish.
- E. Cover floor tile until Substantial Completion.

END OF SECTION

Section 09 68 13

Tile Carpeting

Specifications

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes modular, carpet tile.
- B. Related Requirements:
 - 1. Section 09 65 19 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
- D. Product Schedule: For carpet tile. Use same designations indicated on Drawings and in Section 09 0500 "Finish Key."

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

Section 09 68 13

Tile Carpeting

Specifications

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2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 1. Build mockups of each carpet type, minimum 10 feet square, as directed by the Architect.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.10 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by an approved manufacturer.
- B. Color: Match Architect's samples.
- C. Pattern: Match Architect's samples.
- D. Fiber Content: As indicated on Drawings
- E. Fiber Type: As indicated on Drawings
- F. Pile Characteristic: As indicated on Drawings
- G. Yarn Twist: As indicated on Drawings
- H. Yarn Count: As indicated on Drawings

Section 09 68 13

Tile Carpeting

Specifications

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- I. Density: As indicated on Drawings
- J. Pile Thickness: As indicated on Drawings
- K. Stitches: As indicated on Drawings
- L. Gage: As indicated on Drawings
- M. Surface Pile Weight: As indicated on Drawings
- N. Total Weight: As indicated on Drawings
- O. Primary Backing/Backcoating: As indicated on Drawings
- P. Secondary Backing: As indicated on Drawings
- Q. Backing System: As indicated on Drawings
- R. Size: As indicated on Drawings
- S. Applied Soil-Resistance Treatment: As indicated on Drawings
- T. Antimicrobial Treatment: As indicated on Drawings

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Section 03 3000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For painted subfloors, verify the following:
 - 1. Perform bond test recommended in writing by adhesive manufacturer.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

Section 09 68 13

Tile Carpeting

Specifications

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- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As indicated in Section 09 0500 "Finish Key."
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

Section 09 90 00 Painting

Specifications

09 90 00-1

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation (sanding, stripping, dulling, priming, etc.) of new surfaces/items and field application of paints and coatings where indicated in room finish schedule and drawings;
- B. Paint finish at all new CMU walls, gypsum, veneer plaster, steel doors and hollow metal frames. No paint at ceilings unless specifically noted in drawings.
- C. Paint at new interior and exterior steel fabrications.
- D. Stain all new millwork as scheduled.
- E. Paint at all new millwork items as scheduled
- F. Paint any new exposed conduit, all exposed junction boxes, all exposed ductwork, and all piping and piping insulation; painting of all these items that were previously painted.
- G. Paint at interior and all exterior steel fabrications.
- H. Note: Interior new wood doors shall be stained at factory, unless noted otherwise; if applicable, painting contractor shall be required to stain and seal all edges of doors

1.02 SYSTEM DESCRIPTION

- A. Finish Materials: Conform to applicable code for environmental requirements.

1.03 SUBMITTALS

- A. Product Data: Provide data on all finishing products.
- B. Samples: Submit complete color tear-out chip catalogues of manufacturer's system.
- C. Field Samples: On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface. Final acceptance of colors will be by Architect from job-applied samples.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Store and apply materials in environmental conditions required by manufacturer.
- B. Maintain MSDS sheets on site during construction in three ring binder and have readily available on site at all times.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturers:
 - 1. Sherwin Williams.
 - 2. Benjamin Moore
 - 3. PPG Pittsburg Paints
- B. Coatings: Ready mixed except field catalyzed coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags.
- C. Accessory Materials: Materials required to achieve the finishes specified.
- D. Paint Materials, General: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer, based on testing and field experience.
- E. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
- F. Proprietary Names: Use of Sherwin Williams' proprietary product names to designate materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.
- G. Material Stock: Provide all unused paint/stain material plus one gallon of each finish color/product to Owner. Label product name and color of all stock materials clearly on outside of container.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions under which painting will be performed for compliance with requirements. Do not begin application until unsatisfactory conditions have been corrected.

Section 09 90 00 Painting

Specifications

09 90 00-2

- B. Coordination: Review other Sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - C. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.
 - D. Preparation: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved. Protect all data and electrical outlets. The Contractor shall be responsible for damage to data and electrical outlets due to paint.
 - E. Cleaning: Clean substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not all on wet, newly painted surfaces.
 - F. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Caulk all cracks / imperfections prior to application of primer / paint.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before applying primer.
 - b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
 - G. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances.
 - H. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
 - 1. Touch up bare areas and shop-applied prime coats that have been damaged.
 - I. Wire-brush, clean with solvents and touch up with the same primer as the
 - J. shop coat.
 - K. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
 - L. Masonry Surfaces: Block Fill as needed and fill all voids, cracks and pits to achieve a smooth and consistent final paint surface. f. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
 - 1. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 - 2. Use only thinners approved by the paint manufacturer and only within recommended limits.
 - M. Moisture content report documented and returned to GC to A/E to Owner.
- 3.02 APPLICATION
- A. Application: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 1. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until previous coat has cured. Sand between applications where sanding is required to produce an even smooth surface.
 - 2. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance.

Section 09 90 00 Painting

Specifications

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3. The term exposed surfaces includes areas visible when permanent or built-in fixtures are in place. Extend coatings in these areas to maintain system integrity and provide desired protection.
 4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat.
 5. Paint back of access panels and removable/hinged covers to match exposed surfaces.
 - a. Inspection of Painting: The Contractor shall notify the Architect after each coat of paint is applied in order to allow the Owner and Architect to inspect the application of each coat of paint. Subsequent coats of paint shall not be authorized until the Owner and Architect has inspected the previously applied coat of paint.
 - b. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable and before subsequent surface deterioration. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried.
 - c. Application Procedures: Apply paints and coatings by brush, roller, spray or other applicators according to manufacturer's directions.
 - B. Brushes: Use brushes best suited for the material applied.
 - C. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 - D. Spray Equipment: Use airless spray equipment with orifice size as recommended for the material and texture required.
 1. Minimum Coating Thickness: Apply materials at manufacturer's recommended spreading rate. Provide total dry film thickness of entire system as recommended by manufacturer.
- 3.03 CLEANING
- A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.
- 3.04 SCHEDULE
- A. Paint Schedule: Provide the following paint systems for the various substrates indicated:
- Exterior Iron:
- Surface Prep: SW14 or SW15
- Primer:(1 coat) Kem Kromik Universal Metal Primer. (2.5 mils)
- Two Coats: Water Based Catalyzed Epoxy (2.5 – 3.0 Mils)
- Exterior Metal Doors/Frames:
- Surface Prep: SW 14 or SW 15
- Primer:(1 coat) Kem Kromik Universal Metal Primer. (2.5 mils)
- Two Coats: Water Based Catalyzed Epoxy (2.5 – 3.0 Mils)
- All Interior Wall Surfaces (excluding masonry):
- Surface Prep: SW 8 or SW 12
- Primer: (1 coat) B28W02600 - ProMar 200 Zero VOC Interior Latex Primer White
- Two Coats: B20W12651 - ProMar 200 Zero VOC Interior Latex Eg-Shel
- Interior Drywall - Ceilings:
- Surface Prep: SW 8 or SW 12
- Primer: (1 coat) B28W02600 - ProMar 200 Zero VOC Interior Latex Primer White
- Two Coats: B30W12651 PM 200 o FL Extra)
- Interior Metal:
- Surface Prep: SW 15 or SW 12
- Primer: (1 coat) B66W01310 - PI PROCRYL PR OF W
- Two Coats: B66W01551 - PI MULTI ACR SG EW
- Exterior Wood:
- Surface Prep: SW 23 or SW 12.
- Primer: (1 coat) A-100 Exterior Latex Wood Primer (2.3 mils)
- Two Coats: Water Based Catalyzed Epoxy (2.5 – 3.0 Mils)

Section 09 90 00 Painting

Specifications

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Exterior concrete:

Surface Prep: SW 5, 22, 4, or 12
Primer: (1 coat) ProMar Masonry Conditioner (2.2 mils)
Two Coats: Water Based Catalyzed Epoxy (2.5 – 3.0 Mils)

Exterior and Interior Masonry:

Surface Prep: SW Heavy Duty Block Filler (2 coats)
First Coat: SW Loxon Exterior Acrylic Masonry Primer, A24W300
(8 mils wet, 3.1 mils dry)
Second Coat: Water Based Catalyzed Epoxy (2.5 – 3.0 Mils)
Third Coat: Water Based Catalyzed Epoxy (2.5 – 3.0 Mils)

Rated Walls:

Provide a stencil label in contrasting color of the UL Assembly Number and Hourly Rating. Label shall be located above the ceiling at a frequency not less than 10-feet on center.

Parking Striping:

Traffic Paint: two coats of Promar Alkyd Zone Marking Paint, white and blue, B29W1.

END OF SECTION

Section 09 96 00 High Performance Coatings

Specifications

09 96 00-1

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation (sanding, priming, etc.) of new surfaces/items and field application of paints and coatings where indicated in room finish schedule and drawings.
- B. This section covers coatings for exposed steel columns. If there is a conflict between this specification and other Division 09 "Painting" sections, this section shall take precedence.

1.02 SUBMITTALS

- A. Product Data: Provide data on all finishing products.
- B. Samples: Submit complete color tear-out chip catalogues of manufacturer's system.
- C. Mockups: Provide a mockup on substrate which illustrates preparation, and all coatings

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Store and apply materials in environmental conditions required by manufacturer.
- B. Maintain MSDS sheets on site during construction in three ring binder
- C. Finish Materials: Conform to applicable code for environmental requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturers:
 - 1. Tnemec.
 - 2. Dupont
 - 3. Substitutions: In accordance with Section 01 63 00
- B. Coatings: Ready mixed except field catalyzed coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags.
- C. Accessory Materials: Materials required to achieve the finishes specified.
- D. Bidders desiring to use products other than those specified shall submit their proposal in writing to the architect at least ten (10) days prior to the bid opening. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended dry film thickness and a list of five projects where each product has been used and rendered satisfactory service. No request for substitution shall be considered that would decrease thickness, the number of coats applied or offer a change in the generic type of coating specified. The coating contractor shall submit manufacturer's certified test reports showing that the substitute product(s) equal or exceed the performance of the specified products.

2.02 FINISHES

- A. Schedule at end of section based upon Tnemec product numbers – Basis of Design.

2.03 PERFORMANCE REQUIREMENTS

- A. Polyurethane Zinc-rich Primer
 - 1. Test Method: ASTM G 85 Prohesion
 - a. Requirement: No blistering, cracking, or delamination of film. No more than 1/64" rust creepage at the scribe after 15,000 hours.
 - 2. Test Method: ASTM B 117 Salt Fog
 - a. Requirement: No blistering, cracking, or delamination of film. No more than 1% rusting on the surface and no more than 1/4" rust creepage at the scribe after 20,000 hours.
- B. Polyamide epoxy
 - 1. Test Method: ASTM G 85 Prohesion
 - a. Requirement: No blistering, cracking, or delamination of film. No more than 1/8" rust creepage at the scribe after 5,000 hours.
 - 2. Test Method: ASTM B 117 Salt Fog
 - a. Requirement: No blistering, cracking, delamination or rusting on the plane and no rust creepage at scribe after 10,000 hours (zinc primer).
- C. Thermoset Fluoropolymer

Section 09 96 00 High Performance Coatings

Specifications

09 96 00-2

1. Test Method: ASTM D 4141 EMMAQUA
 - a. Requirement: No blistering, cracking or chalking. No less than 96% gloss retention after 1,260 MJ/m2 EMMAQUA exposure.
 2. Test Method: ASTM D 4587 QUV Exposure (UVA 340 bulbs, Cycle 4: 8 hours UV/4 hours condensation)
 - a. Requirement: No blistering, cracking, or chalking. No less than 93% gloss retention after 10,000 hours exposure.
 3. Volume Solids
 - Requirement: No less than 60% volume solids.
- D. Aliphatic Acrylic Polyurethane
1. Test Method: ASTM D 4141 EMMAQUA
 - a. Requirement: No blistering, cracking or chalking. No less than 70% gloss retention after 500 MJ/m2 EMMAQUA exposure.
 2. Test Method: ASTM D 4587 QUV Exposure (UVA 340 bulbs, Cycle 4: 8 hours UV/4 hours condensation)
 - a. Requirement: No blistering, cracking, or chalking. No less than 93% gloss retention after 2,000 hours exposure.
 3. Volume Solids: Requirement: No less than 60% volume solids

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Verify that substrate conditions are ready to receive work.
- B. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent.
- C. Correct minor defects and clean surfaces which affect work of this Section.
- F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- G. Steel Surfaces:
 - 1 Shop: SSPC-SP6 Commercial Blast Cleaning
 2. Field Touch-UP
 - a. Spot power tool clean all failed areas in accordance with SSPC-SP3.
 - b. Feather remaining intact coatings with failed areas to create smooth transition.
 - c. Spot prime with specified materials.

3.02 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Upon completion of existing surface preparation (not priming), Architect shall visit site for approval to proceed. Contractor shall not proceed until Architect has visited the site and approved the surfaces ready to receive the paint finish.
- C. All exposed steel is to be painted.
- D. Separate steel from dissimilar materials by application of bitumastic coating

3.03 CLEANING

- A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

3.04 SCHEDULE - EXTERIOR SURFACES

- A. Steel (exposed columns indicated to receive high-performance coating):
 1. Surface Preparation: SSPC – SP6 Commercial Blast Cleaning
 2. 1st Coat (Shop Coat & Field Touch-Up) Tnemec Series 90G-1K97
Tnemec-Zinc 2.5-3.5 dry mils
 3. 2nd Coat Tnemec Series 66 HB Epoxoline 3.0-5.0 dry mils
 4. 3rd Coat Tnemec Series 1070 Fluoronar 2.5-3.0 dry mils

END OF SECTION

Section 09 96 20 Decorative Epoxy Flooring

Specifications

09 96 20 - 1

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Epoxy-based floor surfacing system (including integral coved base) on concrete slab floor.
- B. Compounds and accessories needed for a complete installation; including membrane on flooring and Primer (if required by installation conditions)
- C. Sealer.

1.2 REFERENCES

- A. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.
- B. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 1997.
- C. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics; 1996.
- D. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1997.
- E. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine; 1993.
- F. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness; 1997.
- G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998.
- H. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 1997.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Selection Samples: For each product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each product specified, two samples, minimum size 6 inches (150 mm) square, representing actual flooring, color, and patterns.

1.4 QUALITY ASSURANCE

- A. Mock-Up: Provide for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect (36" square) including a 36" section of coved base.
 - 2. Do not proceed with work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in clean, unopened factory-labeled containers.
- B. Store materials in manufacturer's unopened packaging until ready for installation. Store in a dry, protected area, and maintain temperature of storage area between 60 - 90 degrees F.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. At Substantial Completion, submit a one year warranty against defects in materials and workmanship

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. General Polymers: Ceramic Carpet
- B. Key Resin Company: Key Quartz B-125
- C. Approved equal

Section 09 96 20 Decorative Epoxy Flooring

Specifications

09 96 20 - 2

2.2 MATERIALS

- A. Floor Coating: Epoxy floor resurfacing system with blended epoxy and ceramic coated quartz aggregates; system with the following installed properties:
 - 1. Shore D Hardness: 70 to 80, when tested in accordance with ASTM D 2240.
 - 2. Compressive Strength: 16,000 psi, when tested in accordance with ASTM D 695.
 - 3. Tensile Strength: 3,000 psi, when tested in accordance with ASTM D 638.
 - 4. Tensile Elongation: 7.5 percent, when tested in accordance with ASTM D 638.
 - 5. Flexural Strength: 4,000 psi, when tested in accordance with ASTM D 790.
 - 6. Water Absorption: 0.04 percent, when tested in accordance with ASTM D 570.
 - 7. Flame Spread Index: 75 or less, tested in accordance with ASTM E 84 (Class II/B).
 - 8. Surface Finish: Orange Peel, with 0.8 coefficient of friction per ASTM D 2047.
 - 9. Color: As selected by Architect from manufacturer's standard colors.
 - 10. System Thickness: 1/8".
- B. Primer: As recommended by Floor Coating Manufacturer
- C. Liquid Membrane: 1/16" thick, applied as liquid, as recommended by Floor Coating Manufacturer.
- D. Fiberglass Scrim: Provide scrim or similar performing material at existing floor cracks to perform for maximum tensile strength and crack isolation.

2.3 MIX FORMULA/COLOR

- A. To be selected from manufacturer's full color range

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that surface is dry and perfectly clean, free of all oil, grease, detergent, and other contaminants.

3.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Create a surface profile with a steel shot blast machine and dust-free diamond grinders for edges.
- C. Clean surfaces thoroughly prior to installation.
- D. Thoroughly rout and vacuum clean moving cracks and joints; fill with manufacturer's recommended flexible filler material.
- E. Repair non-moving surface deviations with manufacturer's recommended patching compound.

3.3 INSTALLATION

- A. Install flooring system in strict accordance with manufacturer's instructions.
- B. Mix components on site with manufacturer-supplied mix and measure apparatus to ensure timely, accurate mix ratios and to minimize waste.
- C. Apply liquid membrane (on existing ceramic tile floor) using noted trowel.
- D. Prime substrate with manufacturer's recommended primer and proceed with installation of flooring system while primer is still tacky.
- E. Apply flooring system in number of coats and to thickness recommended by manufacturer.
 - 1. Install an integral cove base at perimeter walls and all other locations indicated in drawings; provide height as indicated, but no less than 4".
 - 2. Key in all drains, edges, and transition points according to manufacturer's instructions.
- F. Broadcast aggregate to excess, and allow to cure; subsequently sweep up excess aggregate.
- G. Apply topcoat in number of coats recommended by manufacturer and allow to cure.

3.4 PROTECTION

- A. Protect installed flooring until completion of project.
- B. Touch-up, repair or replace damaged flooring system after Substantial Completion.

END OF SECTION

END OF SECTION

Section 10 11 00 Visual Display Boards & Projection Screens

Specifications

10 11 00-1

PART 1 GENERAL

- 1.01 SECTION INCLUDES
 - A. Marker Boards
 - B. Tackboards.
 - C. Projector Mount, Extension Poles, and Suspended Ceiling Kit.
 - D. Trim, Chalkrail, and accessories.
 - E. Manual Projection Screens.
 - F. Tackless Display Rails.
- 1.02 RELATED SECTIONS
 - A. 26 01 00 – Electrical: Contractor to install Owner-Supplied projectors, as well as supply all other materials for operation of projector (conduit, power, data wiring, etc.).
- 1.03 REFERENCES
 - A. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
 - B. ASTM C543 - Slate Blackboards.
 - C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
 - D. FS CCC-W-408 - Wall Covering, Vinyl-Coated.
 - E. FS L-P-1040 - Plastic Sheets and Strips, Polyvinyl Fluoride.
 - F. HPMA HP - Hardwood and Decorative Plywood.
- 1.04 SUBMITTALS
 - A. Submit under provisions of Section 01 33 00.
 - B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
 - C. Product Data: Provide data on marker boards, tackboards, tackboard surface covering, and trim and accessories, projection screens, ballet barre and brackets.
 - D. Samples: Submit two (2) samples illustrating materials and finish, color and texture of chalkboard, chalkboard and trim, tackboard, and tackboard surfacing.
- 1.05 OPERATION AND MAINTENANCE DATA
 - A. Maintenance Data: Include data on regular cleaning, stain removal.
- 1.06 REGULATORY REQUIREMENTS
 - A. Conform to applicable code for flame/smoke rating for vinyl fabric covered tackboards in accordance with ASTM E84.
- 1.07 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- 1.08 FIELD MEASUREMENTS
 - A. Verify that field measurements are as indicated on shop drawings and instructed by the manufacturer.
- 1.09 WARRANTY
 - A. Provide five (5) year warranty under provisions of Section 01 70 00.
 - B. Warranty: Coverage of chalkboard surface from discoloration due to cleaning, crazing, cracking, staining.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS – VISUAL DISPLAY BOARDS
 - A. Carolina Chalkboards.
 - B. Nelson Adams.
 - C. Claridge
 - d. Substitutions: Section 01 25 00.
- 2.02 MARKER BOARD
 - A. Backing: 3/8 inch particleboard with 0.015 inch aluminum backing sheet.
 - B. LCS face: 24 gauge steel off-white porcelain enamel finish.
- 2.03 TACKBOARD SURFACING MATERIAL
 - A. Backing: 1/4 inch thick hardboard with foil face.
 - B. Cork: Fine grain natural cork, homogeneous composition 1/4" thick.
 - C. Tackboard Covering: Vinyl roll stock
 - 1. Carolina Tackboard No. 1950
 - 2. Claridge Fabricork

Section 10 11 00 Visual Display Boards & Projection Screens

Specifications

10 11 00-2

- 3. Colors: To be selected.
- 2.04 CORE AND FRAME MATERIALS
 - A. Frame and Chalkrail: Aluminum extrusions, ASTM B221, 6061 alloy, temper.
 - 1. Claridge - head #275A, Sides #273A, mullion #272A, chalktrough #271A.
 - 2. Carolina trim series 600.
 - B. Grounds: Aluminum extrusions, surface applied.
 - 1. Claridge: No. 277 ground clip
 - 2. Carolina: Ground System.
- 2.05 ACCESSORIES
 - A. Adhesives: Type used by manufacturer.
 - B. Map Supports: Formed aluminum sliding hooks, roller brackets, to fit map rail.
 - C. Flag Holder: Formed aluminum to fit map rail.
- 2.06 FABRICATION - TACKBOARDS
 - A. Core: 1/4" hardboard
- 2.07 FINISHES
 - A. Tackboard Surface: Vinyl color to be selected. Class "A" fire rated.
 - B. Aluminum Frame, Chalkrail, and Accessories: Anodized to dull finish.
- 2.08 PROJECTION SCREENS
 - A. Acceptable Manufacturers and Models:
 - 1. Claridge Products and Equipment, Inc.; (manual "Mira").
 - 2. Da-Lite company, Inc.; (manual – "Model B").
 - 3. Draper Shade and Screen co., Inc.; (manual – "Luma").
 - B. Sizes:
 - 1. Manual: 8' x 8' screen with no extra drop.
 - C. Screen Fabric: Flame-retardant, mildew-resistant fiberglass with matte white reflective vinyl surface.
- 2.09 CEILING PROJECTOR MOUNTS (Contractor to provide to Owner; no installation by Contractor)
 - A. Acceptable Manufacturers and Models:
 - 1. Chief; Bracket RPA 027.
 - 2. Substitutions – Section 01 25 00.
 - B. Accessories:
 - 1. Ceiling Extension Pole: Chief Pole CMA 100
 - 2. Suspended Ceiling Kit: Chief CMA 440; color shall be white; Chief Fixed Column CMA-012 (12").
- 2.10 TACKLESS DISPLAY RAILS
 - A. Clear anodized aluminum exterior housing with roller-type internal bearings; no exposed fasteners
 - B. Pre-manufactured lengths as indicated on the drawings
 - C. Acceptable Manufacturers and Models:
 - 1. Best Rite: BestBite Model# 505
 - 2. Advantus Corporation: Grip-A-Strip
 - 3. Ghent Manufacturing Inc.: TrapEase

PART 3 EXECUTION

- 3.01 EXAMINATION
 - A. Verify that internal wall blocking is ready to receive work and positioning dimensions are as instructed by the manufacturer.
 - B. Prior to work by other trades above ceiling, conduct coordinational meeting with all other associated trades (including fire alarm and HVAC) so as to assure there are no conflicts with placement of other work above ceiling, nor in path of projection between the projectors and screens.
- 3.02 INSTALLATION
 - A. Install marker boards, and tackboards in accordance with manufacturer's instructions.
 - B. Secure units level and plumb.
 - C. Marker boards: Butt panels tight with concealed spline to hairline joint. Set marker board tight in frame, butt joints tight, hairline.
 - D. Projector Brackets and Ceiling Kits: Use appropriate extension poles where suspended ceilings exceed 11'-0" in height. Use suspended ceiling kits at all other suspended ceiling locations. Install projector bracket at Motorized Projector Lift locations.

Section 10 11 00 Visual Display Boards & Projection Screens

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3.03 MOUNTING HEIGHTS

- A. Mounting heights from finish floor to bottoms of markerboard units in accordance with State D.O.E. Standards:
- | | |
|--|------------|
| 1. Special Education | 30 inches |
| 2. Kindergarten and 1 st Grade Classrooms | 24 inches |
| 3. Grade 2-5 Classrooms | 32 inches. |
| 4. All Workrooms & Staff Areas | 33 inches. |

3.04 CLEANING

- A. Clean work under provisions of 01 70 00; Clean surfaces in accordance with manufacturer's instructions.
- B. Cover surfaces with protective cover, taped to frame; remove protection at Substantial Completion.

3.05 SCHEDULE

- A. Markerboard/Tackboard: see drawings
- B. Tackboard: see drawings
- C. Map Rail: Head trim at each markerboard and tackboard.
- D. Map Hooks: 4 per markerboard and tackboard.
- E. Rollerbrackets: 2 per markerboard.
- F. Chalktrough: Continuous trim at each markerboard. Provide solid end caps w/adiused edges, each end.
- G. Flag Holder: 1 per classroom.
- H. Manual Projection Screens: see drawings for size.
- I. Projector Extension Poles: Media Center; lengths as required to achieve 9'-6" AFF height to bottom of projector.

END OF SECTION

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Signage

Specifications

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PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. Section Includes:
 - 1. Exterior signage
 - 2. Interior signage
 - 3. Interior film

1.2 QUALITY ASSURANCE

- A. **Supplier: Obtain all signage products in this and other signage specifications through a single supplier from a single manufacturer. Supplier must install all signage scope.**
- B. Regulatory Requirements: Products shall meet requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installation shall be performed by installer specialized and experienced in work similar to that required for this project.

1.3 SUBMITTALS

- A. Submit in accordance with requirements of Division 1.
- B. Product Data: Submit product data for specified products. Include material details for each sign specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
- D. Samples:
 - 1. Submit supplier's standard color chart for selection purposes and selected colors for verification purposes.
 - 2. Submit physical sample of sign material & color for verification purposes.
- E. Installation: Submit supplier's installation instructions.
- F. Closeout Submittals:
 - 1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
 - 2. Submit warranty documents specified herein.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 1.
 - 1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
 - 2. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 3. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
 - 4. Handle products in accordance with manufacturer's instructions.

1.5 WARRANTY

- A. Project Warranty: Comply with requirements of Division 1.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: One year from product ship date.

2 PRODUCTS

2.1 SIGNAGE SYSTEMS

- A. Acceptable Manufacturers:

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1. Basis of Design: ASI Signage Innovations, 520 Commerce Point, Harahan, LA 70123; (504) 704-1000
Contact: Ercelle Anthony (cell) (225) 229-5984. ercelle.anthony@asisignage.com
 2. Kroy Sign Systems
 3. Mohawk Sign Systems
 4. Substitutions: Submit in accordance with Section 01600.
 5. Other manufacturers shall submit an equivalent style signage system 10 days prior to advertised bid date before Approval is issued. The equivalency shall be the sole discretion of the Architect.
- B. Acceptable Product: As listed below. Refer to Signage Drawings for Locations and Quantities
- C. Exterior Signage
1. **E1a – Exterior Building Mounted Logo Sign**
 - a) ASI LF Series Face-Lit Dimensional Letters and Logo on Custom Shaped Backer
 - b) Fabricated Aluminum Letters and Logo:
 - 1) Finish: Painted up to (3) Standard Flat or Metallic Color
 - 2) Height: As shown on drawings
 - 3) Depth: 2"
 - 4) Mounting: Mechanically fastened to backer
 - c) Backer:
 - 1) Finish: Painted (1) Standard Flat or Metallic Color
 - 2) Depth: 1/8"
 - 3) Size: As shown on drawings
 - 4) Seams as required to align with the building joint pattern and limits of material
 - 5) LED wire leads to run through back panel to single location. Contractor is to provide 1-1/2" conduit and pull string for power to be accessed at time of sign installation. Access panel provided by contractor.
 - 6) Mounting: Screw Mount
 2. **E1b – Exterior Dimensional Letters mounted to canopy**
 - a) ASI LF Series Halo-Lit Dimensional Letters on Custom Shaped Back Panel
 - 1) Fabricated Aluminum: Finish: Painted (1) Standard Flat or Metallic Color
 - 2) Height: As shown in drawings
 - 3) Depth: 2"
 - 4) Letter to be 1-1/2" Pin mounted to 1/4" Aluminum back panel with raceway and painted finish
 - 5) Mounting: Raceway bolted to tube steel supports to be provided by General Contractor
 3. **E2 – Exterior Logo Sign**
 - a) ASI LPS Series Aluminum with Cut Acrylic and Vinyl Letters and Accents
 - 1) Finish: Painted up to (3) Standard Flat or Metallic Color
 - 2) Height: As shown on drawings
 - 3) Depth: 3-1/2"
 - 4) 1/4" thick acrylic
 - 5) Standard Vinyl Selected from Mfr's selections
 - 6) Mounting: mechanically fasten to building
 4. **E3-Exterior Logo Sign**
 - a) ASI LPS Series Aluminum with Cut Acrylic and Vinyl Letters and Accents
 - 1) Finish: Painted up to (3) Standard Flat or Metallic Color
 - 2) Size: As shown on drawings
 - 3) Depth: 3-1/2"
 - 4) 1/4" thick acrylic
 - 5) Standard Vinyl Selected from Mfr's selections
 - 6) Mounting: mechanically fasten to Press Box Wall
- D. Interior Signage
1. **Egress Signage**
 - a) **Stair ID**
 - 1) ASIntouch III Series Frameless Acrylic Plaque with Oversized Acrylic Backer

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- 2) ASIntouch III Series ADA Ready Plaque: 8-1/2" h x 8-1/2" w x 1/8" thick
Acrylic, 2nd Surface Finish: Painted (1) Standard Flat or Metallic Color; Direct
Printed Raised Text and Braille
 - 3) Acrylic Back Panel, 9"h x 9" w x 1/8" thick, 1st Surface Painted (1) Standard
Flat of Metallic Color
 - 4) Mounting: Tape Mount
- a1) **Stair Level ID**
- 1) ASIntouch III Series Frameless Acrylic Plaque with Oversized Acrylic Backer
 - 2) ASIntouch III Series ADA Ready Plaque: 8-1/2" h x 8-1/2" w x 1/8" thick
Acrylic, 2nd Surface Finish: Painted (1) Standard Flat or Metallic Color; Direct
Printed Raised Text and Braille
 - 3) Acrylic Back Panel, 9"h x 9" w x 1/8" thick, 1st Surface Painted (1) Standard
Flat of Metallic Color
 - 4) Mounting: Tape Mount
- b) **Elevator ID**
- 1) ASIntouch III Series Frameless Acrylic Plaque
 - 2) ASIntouch III Series ADA Ready Plaque: 18" h x 24" w x 1/4" thick Acrylic, 2nd
Surface Finish: Painted (1) Standard Flat or Metallic Color; Direct Printed
Text and Evacuation Map
 - 3) Architect to provide usable evacuation artwork
 - 4) Mounting: Tape Mount
- c) **Exit ID**
- 1) ASIntouch III Series Frameless Acrylic Plaque
 - 2) ASIntouch III Series ADA Ready Insert: 3-1/2" h x 5-1/2" w x 1/8" thick
Acrylic, 2nd Surface Finish: Painted (1) Standard Flat or Metallic Color; Direct
Printed Raised Text and Braille
 - 3) Acrylic Back Panel, 4"h x 6" w x 1/8" thick, 1st Surface Painted (1) Standard
Flat of Metallic Color
 - 4) Mounting: Tape Mount
2. **Restroom ID**
- 1) ASIntouch III Series Frameless Acrylic Plaque
 - 2) ASIntouch III Series ADA Ready Plaque: 8-1/2" h x 8-1/2" w x 1/8" thick, 2nd
Surface Finish: Painted (1) Standard Flat or Metallic Color; Direct Printed
Raised Text and Braille
 - 3) Acrylic Back Panel, 9"h x 9" w x 1/8" thick, 1st Surface Painted (1) Standard
Flat of Metallic Color
 - 4) Mounting: Tape Mount
3. **Room ID**
- 1) ASIntouch III Series Frameless Acrylic Plaque with Oversized Acrylic Backer
 - 2) ASIntouch III Series ADA Ready Plaque: 8-1/2" h x 8-1/2" w x 1/8" thick
Acrylic, 2nd Surface Finish: Painted (1) Standard Flat or Metallic Color; Direct
Printed Raised Text and Braille
 - 3) Acrylic Back Panel, 9"h x 9" w x 1/8" thick, 1st Surface Painted (1) Standard
Flat of Metallic Color
 - 4) Mounting: Tape Mount
4. **Suite ID**
- 1) ASIntouch III Series Frameless Acrylic Plaque with Oversized Acrylic Backer
 - 2) ASIntouch III Series ADA Ready Plaque: 12-3/4" h x 8-1/2" w x 1/8" thick
Clear Acrylic, Direct Printed Raised Text and Braille
 - 3) Acrylic Back Panel, 13-1/4" h x 9" w x 1/8" thick, 1st Surface Painted (1)
Standard Flat of Metallic Color
 - 4) Mounting: Clear Anodized Pucks

E. Specialty Signage

1. S1 – Interior Logo Sign

- a) ASI LF Series Halo-Lit Dimensional Letters and Logo on ASI Legacy Series Cabinet
- b) Letters:

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- 1) Finish: Painted (1) Standard Flat or Metallic Color
- 2) Size: As shown on drawings
- 3) Depth: 2"
- 4) Mounting: 1-1/2" Projecting Stud Mount to Cabinet
- c) Cabinet:
 - 1) Finish: Finish: Painted (1) Standard Flat or Metallic Color
 - 2) Depth: approx. 5" TBD
 - 3) Trim Retainer for Concealed Mounting
 - 4) Size: As shown on drawings
 - 5) Seams as required by limitations of materials
 - 6) LED wire leads to run in cabinet to single location. Contractor is to provide 1-1/2" conduit and pull string for power to be accessed at time of sign installation. Access panel provided by contractor.

2. S2 – Interior Dimensional Letters

- 1) ASI LPS Series, Flat Cut Aluminum
- 2) Painted (1) Standard Flat of Metallic Color
- 3) Height: As shown on drawings
- 4) Depth: 3/8"
- 5) Mounting: Stud with 1/4" spacers

3. S5 – Building Plaque

- a) ASI LC Series Cast Aluminum Plaque
 - 1) Size: 15" h x 24" w
 - 2) Standard Borders and Finishes
 - 3) Allow for 1 letter per 1 sq. inch of plaque area, content to include:
 - a. Graphics: Image of the seal of the State of Louisiana
 - b. Name of Project
 - c. Year facility was completed.
 - d. Name of current Governor
 - e. Name of Architect
 - f. Name of Contractor
 - g. Text – as provided by Architect
 - 4) Mounting: Stud Mount (BLOCKING REQUIRED BY CONTRACTOR)

4. F1 – Digitally Printed Wall Wraps

- a) ASI LTV Series Wall Wraps with Custom Graphics
- b) Acceptable Product: Arlon DPF 4200 Canvas Finish
- c) Sizes to be verified on elevation plan sheet
- d) Seams every 4'
- e) General Intent for Custom Graphic Display Wall, Specifics to be Designed and Coordinated w/ Owner and Architect:

~~(1) All signs shall be supplied by the contractor. The contractor shall be responsible for the design, fabrication, and installation of all signs. The contractor shall be responsible for the design, fabrication, and installation of all signs. The contractor shall be responsible for the design, fabrication, and installation of all signs.~~

2.2 FABRICATION - GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
- C. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.
- D. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
- E. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

3 EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.

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- B. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

- A. Install product in accordance with supplier's instructions.
- B. Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance.
- C. Install product level, plumb, and at heights indicated. Vinyl backers for signs applied to glass.
- D. Install product at heights to conform to Americans with Disabilities Act Accessibility Guidelines (ADAAG) and applicable local amendments and regulations.
- E. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
 - 1) Interior Signs: Within 1/4 inch vertically and horizontally of intended location.

3.3 CLEANING, PROTECTION, AND REPAIR

- A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.
- B. Remove temporary coverings and protection to adjacent work areas. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project in accordance with provisions in Division 1.

3.4 SIGN SCHEDULE

- A. Refer to signage schedule and Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

Section 10 21 13 Toilet Compartments

Specifications

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PART 1 GENERAL

- 1.01 SECTION INCLUDES
- A. Solid phenolic core toilet compartments, floor mounted and overhead braced.
 - B. Urinal screens; full-length; floor mounted.
 - C. Compartment installation and door hardware.
- 1.02 RELATED SECTIONS
- A. Section 10 80 00 - Toilet and Bath Accessories.
- 1.03 SUBMITTALS
- A. Submit under provisions of Section 01 30 00.
 - B. Product Data: Literature indicating revisions to typical panel, pilaster, door, hardware and fastening.
 - C. Shop Drawings: Submit three sets of the following:
 - 1. Dimensioned plans indicating layout of toilet compartments.
 - 2. Dimensioned elevations indicating heights of doors, pilasters, separation partitions, and other components; indicate locations and sizes of openings in compartment separation partitions for toilet and bath accessories to be installed in partitions; indicate floor/ceiling clearances.
 - 3. Details indicating anchoring components and methods for project conditions; indicate components required for installation, but not supplied by manufacturer.
 - D. Samples: Two manufacturer's color cards representing manufacturer's full color palette. Submit one sample of the following:
 - 1. All hardware.
 - 2. Pilaster (12 inch square)
 - 3. Divider Panel (12 inch square)
 - 4. Full High Aluminum Mounting Bracket
 - 5. Sample section of continuous hinge
- 1.04 DELIVERY, STORAGE AND HANDLING
- A. Store compartment components until installation in unopened cartons in vertical position, with adequate support to ensure flatness and to prevent damage to prefinished surfaces.
- 1.05 ENVIRONMENTAL REQUIREMENTS
- A. Do not deliver materials or begin construction activities of this section until building is enclosed, with complete protection from outside weather, and building temperature maintained at 60°F minimum.
- 1.06 QUALITY CONTROL
- A. Specified, approved, and/or substituted manufacturers shall be required to meet the specific requirements for warranty, materials and accessories of this Section, as well as means of attachment regardless of the manufacturer's standards. At the Architect's option, the Contractor may specifically request substitution approval (of other means and materials) from the Architect
- 1.07 EXISTING PROJECT CONDITIONS
- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work
 - 1. Established Dimensions: Locate any items that may conflict with location of pilasters, end panels, existing piping, electrical switches and devices, thermostats, hose bibs, etc.; propose any revised location of panels or sizes of compartments in "clouded" markings on submittal and submit to the Architect for approval – failure to do so shall allow the Architect to require the Contractor (with no additional expense to the Owner) to take whatever steps that are necessary (as required by the Architect) to effect a satisfactory installation.
 - 2. Existing floor and wall anchors: NOTE: CONTRACTOR'S OPTION – Contractor has the option to use the existing anchors, locations as necessary to provide a secure, anchored, and complete installation. Contractor shall review the existing conditions with the architect at the site prior to preparing and submitting shop drawings to obtain the architect's preliminary

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approval of proposed installation procedures and products. Regardless of the Contractor Option selected, proposed, and approved, the Contractor shall be responsible for the acceptability of the installation and shall provide all specified and standard warranties required by the Contract Documents.

1.08 WARRANTY

- A. Provide written warranty meeting the following requirements: Entire toilet partition shall be warranted for fifteen (15) years, against breakage, corrosion, and delamination, to include hardware; replaced without charge, excluding labor. Panels, pilasters, and doors shall be warranted for twenty-five (25) years against breakage, corrosion, and delamination; replaced without charge, excluding labor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Partition Systems, Inc./ Columbia Partitions; Super HD-8433-BR
 - 2. Metpar
 - 3. General Partition Manufacturing
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 63 00.
- C. **NOTE: MANUFACTURERS NOTED AS ACCEPTABLE ABOVE MUST PROVIDE HARDWARE QUALITY AND PANEL SIZES SPECIFIED HEREIN; MANUFACTURER'S STANDARD MAY NOT BE EQUAL TO THAT SPECIFIED IN THIS SECTION.**

2.02 MATERIALS

- A. General: Provide material which has been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Solid Phenolic shall meet or exceed all requirements for Class "A" Flame Spread Rating calculated according to ASTM E-84-91A and shall carry a UL Class "A" Fire Rating Certification.
- B. Material shall be solid phenolic with a high pressure melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable.
 - 1. Doors – minimum .75" finished thickness.
 - 2. Divider Panels – minimum .75" finished thickness
 - 3. Pilasters – minimum .75" finished thickness
- C. Head Rails: Continuous stainless steel with anti-grip profile with integral reinforcing channel and curtain track; satin anodized finish, with (.125" thick wall) cast socket wall brackets. Rails shall have minimum 2" wall height with .125" minimum wall thickness. Provide head rail braces spanning from pilaster to wall at full-length end-of-row and ADA toilet compartments; provide at minimum of every third divider panel if compartments exceed three compartments in a row.
- D. Attachments, Screws, and Bolts: Chrome plated brass; theft-proof type; through-bolted.
- E. Hardware: Stainless steel:
 - 1. Continuous hinges: continuous 14 gauge stainless steel hinge or continuous extruded 6063-T5 aluminum hinge, full height of door; 3" wide and shall have five (5) stainless steel wire springs for self-closing action; pivot pin shall be .250" in diameter, and shall be made of type 302/304 stainless steel. Hinges shall provide emergency access by lifting door. Hinges shall be pre-drilled for mounting to door and pilaster. Mounting holes shall be at 9" o.c for through-bolting with stainless steel fasteners.
 - 2. Pilaster shoes: ASTM A 167, type 302/304 stainless steel, minimum 4" high, 18 gauge, finished with #3 directional polish, attached with stainless steel through bolts.
 - 3. Continuous brackets: Full height of panel, extruded 6063-T5 aluminum with a satin anodized finish; minimum weight shall be 1.685 pounds per lineal foot. Inside opening of bracket shall match panels and pilasters thickness. All holes for mounting to wall and panel/pilaster shall be pre-drilled. Holes are to be spaced at 9" o.c. along the full length of the bracket for a total of (14) holes for mounting to wall and (7) holes for mounting to the panel/pilaster. Each bracket is to have a minimum wall thickness of .125".
 - 4. Slide latch: Heavy duty cast stainless steel with a satin finish, surface mounted. Slide bar .150" thick, 1.0" wide and 3.7" long. Latch shall have an internal stainless steel buffering

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- spring to prevent damage when door is inadvertently slammed against latch. Latch knob is to be riveted to the slide bar and then welded to insure that the knob will not come off.
5. Strike and keeper: Heavy duty cast stainless steel with satin finish. The strike and keeper shall be 2.50" high, with the mounting holes at 1.5" o.c. and the wall thickness shall be a minimum of .125"; integral rubber bumper door stop.
 6. Coat hook: Heavy duty cast stainless steel with a satin finish with integral bumper. The hook portion shall have a finished diameter of .25". The bumper/coat hook shall be 2.34" high, 1.23" wide and shall protrude out from the door 3.05"; provide one at each compartment door.
 7. Door stop: Heavy duty cast stainless steel with satin finish. 2.125" base diameter and shall protrude 1.8" from the wall. The bumper at the end of the door stop shall be .25" thick. The diameter of the shaft shall be .6875". Furnish one for each ADA door.
 8. Pull handle: Heavy duty cast stainless steel with satin finish; protrude from face of door .94" and shall be 4.375" long. The pull handle shall have mounting holes drilled and tapped for 10/24 threads at 3.5" o.c. The pull handle shall be .655" wide and shall be mounted back to back with the slide latch. Furnish one for each ADA door.
 9. Anchorages and fasteners: Chrome plated brass with theft proof heads, through-bolted unless noted otherwise. No chrome plated steel.

2.03 FINISHING

- A. Panels and Screens: Up to two colors shall be selected by Architect from manufacturer's standard colors.

2.04 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for partition system, complete with all accessories and hardware listed in this specification and as required for installation of fully functional system, unless otherwise noted. Provide units with cutouts and drilled holes to receive partition-mounted hardware, accessories, and grab bars as indicated.
- B. Overhead braced and floor anchored partitions:
 1. Furnish heavy duty cast stainless steel "Z" bars, complete with stainless steel threaded rods, lock washers and leveling-adjusting nuts at pilaster, to permit structural connection at floor.
 2. Make provisions for setting and securing continuous extruded aluminum anti-grip headrail at top of each pilaster.
 3. Furnish stainless steel shoe at each pilaster to conceal supports and leveling mechanism.
- C. Doors: Unless noted otherwise, provide 24" wide in-swinging doors for standard toilet partitions and 36" wide out-swinging doors with a minimum 32" wide clear opening for partitions indicated to be handicapped accessible.
- D. Floor anchored privacy screens (urinals): Furnish screens consisting of a pilaster and a panel of the same construction and finish as the toilet partitions; furnish in accordance with the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 1. Measure areas to receive compartments; verify area dimensions are in accordance with shop drawings.
 2. Verify built-in framing, anchorage, bracing, and plumbing fixtures are in correct location.
- B. Installer's Examination:
 1. Have installer examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable
 2. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
 3. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 PREPARATION

- A. Surface Preparation:
 1. Prepare openings in compartment separation partitions for toilet and bath accessories to be installed in partitions; marring of partition finish is prohibited.

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Specifications

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2. Locate openings in accordance with shop drawings and accessory manufacturer's installation instructions and templates.

3.03 INSTALLATION

- A. Install compartments to specified tolerances in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Attach components to adjacent materials and to other components using purpose-designed fastening devices. Install partitions rigid, straight, plumb, and level. Provide clearances no more than .5" between pilasters and panels, and not more than 1.0" between panels and walls. No evidence of drilling, cutting, and patching shall be visible in finished work.
 1. Attach continuous wall brackets to walls with the following:
 - a. Solid Masonry: #14 x 1.5" long stainless steel phillips pan head screws and plastic #14/16 anchors at 9" o.c. vertical spacing.
 - b. Cavity Masonry: .25" diameter x required length stainless steel toggle bolts at 9" o.c. vertical spacing.
- C. Adjust pilaster anchors for floor variations; conceal anchors with pilaster shoes. Secure pilasters to floor and level, plumb, and tighten. Secure headrail to each pilaster with not less than two (2) through-bolted stainless steel fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- D. Equip each compartment door with hinges, and door latch.
- E. Install door strike keeper on pilasters in alignment with door latch.
- F. Equip each compartment door with one coat hook and bumper; install in location so as to perform as door bumper.
- G. Screens: attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.
- H. Installation Tolerances:
 1. Maximum variation from plumb or level: 1/8 inch.
 2. Maximum displacement from indicated position: 1/8 inch.
 3. Clearance between wall surface and panels or pilasters: 1-1/2 inch, maximum.

3.04 ADJUSTING

- A. Adjust door hardware for uniform clearance between doors and pilasters.
- B. Adjust door hinges to attain free movement, to locate in-swinging doors in partial open position when unlatched; and to return out-swinging doors to closed position.
- C. Adjust door hardware to align door strike keeper on each pilaster with door latch.

3.05 PROTECTION OF INSTALLED PRODUCTS

- A. Prevent damage to product finishes by subsequent construction activities.
- B. Repair damaged finishes; replace components having damaged finish if repair is not possible.
- C. Remove factory protective coverings and clean finish surfaces in accordance with manufacturer's instructions before final inspection.

END OF SECTION

Section 10 44 00

Fire Protection Specialties

Specifications

10 44 00-1

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Work this section includes the furnishing of all labor, material, tools and services necessary for the complete installation of fire extinguishers and cabinets as shown on the plans and as described in these specifications.
- 1.02 RELATED SECTIONS
 - A. 04 22 00 - Concrete Unit Masonry: Rated interior corridor walls to accept cabinets.
 - B. 09 29 16 - Gypsum Board Systems.
- 1.03 QUALITY ASSURANCE
 - A. All materials to conform to requirements of NFPA 10 for portable fire extinguishers.
- 1.04 REFERENCES
 - A. NFPA 10 - Portable Fire Extinguishers.
 - B. ADAAG - American with Disabilities Act Accessibility Guidelines.
 - C. ASTM E-814 - Fire Rated Cabinet
- 1.05 SUBMITTALS
 - A. Submit under provisions of Section 01 33 00.
 - B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
 - C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
 - D. Conform to ADAAG code for access for the handicapped.

PART 2 - PRODUCTS

- 2.01 MANUFACTURERS
 - A. JL Industries: Cosmopolitan.
 - B. Larsen's; Architectural Series.
 - C. Substitutions: In accordance with Section 01 63 00
- 2.02 MATERIALS
 - A. EXTINGUISHERS
 - 1. One 10# dry chemical, 4A, 40 BC minimum at each location. Provide BC on wall hook in Kitchen.
 - 2. Include extinguisher tags with monthly inspection record.
 - B. CABINETS
 - 1. Cabinets are to be fully recessed with 5/16" trim.
 - 2. Cabinet must be sized for recessed installation in wall depths indicated for plans.
 - 3. Solid door with black vertical die-cut lettering.
 - 4. One hour fire rated where located in rated walls.
- 2.03 FINISH
 - A. CABINETS
 - 1. Aluminum door, mill finish; steel cabinet with white baked enamel finish.

PART 3 - EXECUTION

- 3.01 INSPECTION
 - A. Verify rough opening sizes in walls and sufficient blocking for installation of cabinets.
- 3.02 INSTALLATION
 - A. Install cabinets in strict accordance with manufacturer's written directions. Install tight and anchor securely to walls. Leave cabinet in clean condition.
 - B. Install so that perimeter rolled edge is tightly against surface of wall; caulk perimeter only if necessary and if directed by Architect to eliminate any crevasses at perimeter.

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Fire Protection Specialties
Specifications

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END OF SECTION

Section 10 51 33 Phenolic-Core Lockers

Specifications

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes athletic phenolic lockers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of phenolic locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. Shop Drawings: For phenolic lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show details full size.
 - 3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 4. Show locations and sizes of cutouts and holes for items installed in lockers.
 - 5. Show locker fillers, trim, base, sloping tops, and accessories.
 - 6. Show locker numbering sequence.
- C. Samples for Initial Selection: For the following:
 - 1. Phenolic panel color samples.
- D. Samples for Verification: For the following products:
 - 1. Phenolic panels, not less than 8 by 10 inches, for each type, color, pattern, and surface finish.
 - 2. Corner pieces of locker front frame joints between stiles and rail, as well as exposed end pieces, not less than 18 inches wide by 18 inches high by 6 inches deep.
 - 3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size locker doors, complete with specified door hardware. Furnish no fewer than five doors of each type and color installed.
 - 2. Full-size units of the following locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Hinges.
 - b. Pulls.
 - c. Shelf rests.
 - d. Keypad Locks

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

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Phenolic-Core Lockers

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1. Build mockup of typical corner, including one locker on each side of corner and corner filler, including door panel with specified door hardware, as shown on Drawings.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver lockers until painting and similar operations that could damage lockers have been completed in installation areas. If lockers must be stored in other-than-installation areas, store only in areas where environmental conditions are the same as those in final installation location, and comply with requirements specified in "Field Conditions" Article.
- 1.9 FIELD CONDITIONS
- A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 75 percent during the remainder of the construction period.
- B. Field Measurements: Where lockers are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
- 1.10 COORDINATION
- A. Coordinate sizes and locations of concealed wood support bases.
1. Requirements are specified in Section 06 1000 "Rough Carpentry."
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.
- 1.11 WARRANTY
- A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of locks or hardware.
 - c. Deterioration of wood and other materials beyond normal use.
 2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 PHENOLIC LOCKERS
- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Famous Lockers, Inc.
 2. Columbia Lockers.
 3. Global Industrial.
 4. Hollman, Inc.
 5. List Industries Inc.

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Phenolic-Core Lockers

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6. Spec-Rite Design, LLC.
 7. SPECTRUM.
 - B. Basis-of-Design Product: Subject to compliance with requirements, provide Hollman Lockers, or comparable product by an approved manufacturer.
 - C. Construction Style: Flush overlay.
 1. Athletic Baseball Lockers as indicated on drawings.
 - D. Locker Body: Fabricated from phenolic-core panels covered on all sides.
 1. Side Panels: 3/4 inch thick.
 2. Top Panel: 3/4 inch thick.
 3. Bottom Panel: 3/4 inch thick.
 4. Exposed Panel Edges: Straight profile; eased edges to remove sharpness; machine polished and free from tooling imperfections.
 - E. Doors: Fabricated from phenolic-core panels covered on both sides with melamine resin impregnated decorative overlay.
 1. Thickness: 1/2 inch thick.
 2. Panel Edges: Crescent profile, machine polished and free from tooling imperfections.
 3. Corners: Rounded.
 - F. End Panels: Match style, material, construction, and finish of phenolic doors.
 - G. Shelves: Fabricated from phenolic-core panels covered on both sides with thermoset decorative overlay; fixed and adjustable, as indicated.
 1. Thickness: 3/4 inch.
 2. Exposed Edges: Crescent profile, machine polished and free from tooling imperfections.
 - H. Corners and Filler Panels: 1/2 inch thick panels. Match style, material, construction, and finish of phenolic doors.
 - I. Phenolic Colors, Patterns, and Finishes:
 1. Selected and customized from Manufacturer's Full Range of colors, patterns and finishes.
- 2.2 MATERIALS
- A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- 2.3 HARDWARE
- A. General: Provide manufacturer's standard locker hardware complying with the requirements in this Section.
 - B. Frameless Hinges (European Type): Fully concealed, self-closing, nickel-plated steel, with not less than 125 degrees of opening.
 1. Provide two hinges for doors 36 inches high and less.
- 2.4 ACCESSORIES
- A. Key Pad Locks: Digilock® surface mounted keypad operated electronic lock with integral pull handle, strike plate and motorized deadlatch. Including assigned use with manager bypass key and battery powered. Standard brushed nickel finish (2.14 in by 3.87 in) with nut post mount.
 - B. Number Plates: 1-1/2-inch-diameter, etched, embossed, or stamped, stainless-steel plates with black numbers and letters at least 1/2 inch high. Identify lockers in sequence indicated on Drawings.
 - C. Nameplates: 6-inch-high by locker width, custom magnetic plates with custom graphic/logo as approved by Architect. Identify lockers as indicated on Drawings.
- 2.5 FABRICATION
- A. Fabricate each locker with shelves, an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments.
 1. Fabricate lockers to dimensions, profiles, and details indicated.
 2. Ease edges of corners of solid-wood members to 1/16-inch radius.

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- B. Fabricate components square, rigid, without warp, and with finished faces flat and free of scratches and chips. Accurately factory machine components for attachments. Make joints tight and true.
 - 1. Fabricate lockers using manufacturer's standard construction, with joints made with dowels, dados, or rabbets. Dado side panels to receive shelving except where indicated to be adjustable.
- C. Number Plates: Inlay number plates flush in each locker door, near top, centered.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Condition lockers to average prevailing humidity conditions in installation areas before installation.
- B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION

- A. Install wood support base.
- B. Install lockers level, plumb, and true; use concealed shims.
- C. Connect groups of lockers together with manufacturer's standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.
- D. Install lockers without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Installation Tolerance: No more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line. Shim as required with concealed shims.
- E. Locker Anchorage: Fasten wood lockers through back, near top and bottom, at ends with No. 8 brass-finished, flush-head wood screws sized for 1-inch penetration into wood base wood framing, blocking, or furring and No. 8 pan-head sheet metal screws through metal backing or metal framing behind wall finish and spaced not more than 16 inches o.c.
- F. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.
- G. Install keypad locks per manufacturer's instructions.
- H. Install number plates and nameplates after lockers are in place.

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1. Attach number plate on each locker door, near top, centered, with at least two screws with finish matching number plate.
 2. Insert nameplate into matching nameplate holder on each door, centered below number plate. Attach nameplate holder with at least two screws.
- 3.4 ADJUSTING, CLEANING, AND PROTECTION
- A. Clean, lubricate, and adjust hardware. Adjust doors to operate easily without binding. Verify that integral locking devices operate properly.
 - B. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
 - C. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

Section 10 73 00 Extruded Aluminum Walkway Covers

Specifications

10 73 00-1

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The bidding requirements, general conditions, supplementary conditions, drawings and requirements of division one specification shall apply to work specified in this section.
- B. Refer drawings for profiles.

1.02 DESCRIPTION OF WORK

- A. The extent of aluminum walkway cover and door canopies is shown on the drawings and as specified herein.
- B. Definition: Extruded Aluminum Walkway Cover shall consist entirely of extruded aluminum sections (roll-formed not acceptable). System shall consist of heli-arc welded, one-piece rigid structural bents (column and beam assemblies), decking, fascia, accessory items and hardware to provide a complete system.
- C. Water shall drain from deck into beams, out at grade level of columns through drainholes.

1.03 SUBMITTALS

- A. Shop Drawings: Submit detailed drawings, layout of walkway cover system, bent locations (identify drain columns and wet bents), all mechanical joint locations with complete details, connections, jointing and accessories. Include details of concrete footings and bent anchorage.
- B. Product Data: Submit manufacturer's product data, specifications, component performance data and installation instructions.
- C. Calculations: Provide signed and sealed structural calculations for the proposed walkway cover, by a professional engineer registered in the state of Louisiana, who professes his discipline to be structural engineering; any footings and anchoring for the canopies shall be designed by the same engineer.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following except as otherwise indicated:
 - 1. IBC, 2012 edition with local amendments specific to project location.
 - 2. AWS (American Welding Society) standards for structural aluminum welding.
- B. Manufacturer: Obtain aluminum covered walkway system from only one (1) manufacturer, although several may be indicated as offering products complying with requirements.
- C. Installer Qualification: Firm with not less than three (3) years experience in installation of aluminum walkway covers of type and installation methods similar to work of this section.
- D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work. However, allow for adjustments within specified tolerations wherever taking of field measurements before fabrication might delay work.
- E. Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- F. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system (sidewalks, curbs, building fascias, etc.)

1.05 PERFORMANCE REQUIREMENTS

- A. System performance: Provide aluminum covered walkway system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:

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1. Structural design for wind forces: Comply with IBC 2009. Refer to the Structural drawings for design criteria.
- B. Sizes shown on drawings are to be considered minimum.
- C. Structure shall be capable of sustaining icing, hail, hurricane force winds and supporting occasional concentrated load such as being walked upon for temporary repairs.

PART 2 - PRODUCT

2.01 ACCEPTABLE MANUFACTURERS

- A. Perfection Architectural Systems
- B. Peachtree Protective Covers.
- C. Substitutions: Section 01 2500

2.02 MATERIALS

- A. Bent Sections: U-Bent style, other bent style(s) as appropriate at junction with existing structures; all aluminum extrusions shall be alloy 6063 heat treated to a T-6 temper.
- B. Standard finish for all components shall be medium bronze anodized.
- C. Sizes and thicknesses of components shall be designed by the manufacturer, as required to meet the Performance Requirements of this Specification and conditions indicated in drawings. Design shall address the following components:
 1. Columns
 2. Beams
 3. Deck
 4. Transitions
 5. Drainage
 6. Foundations
- D. Fasteners:
 1. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer. Each fastener shall have minimum strength of 350 pounds.
 2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets and mandrel.
 3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
 4. Tek Screws: not permitted.
- E. Flashing and Trim: Minimum 0.032" aluminum.
- F. Deck Spans/ Juncture with Buildings:
 1. Center bent spacing; refer to drawings.
 2. Refer to details and drawings for conditions at covers to buildings.
- G. Connections and Bearing/Anchors:
 1. Surface attachments shall be allowed only where and if indicated in drawings.
 2. Bidders shall visit site prior to bid to assess existing conditions for attachment.
 3. Provide appropriate anchors, support bearing angles and any necessary blocking and anchoring angles.
- H. Warranty:
 1. Manufacturer shall warrant the entire system against defects in labor and materials for period of two years commencing on date of Substantial Completion.
 2. Intention of this warranty is the manufacturer will come onto the jobsite and do all necessary to effect corrections of any deficiencies.
 3. Prima Facie Evidence of defects in labor and materials may include but is not limited to, one or more of the following:
 - a. Moisture leaks
 - b. Metal failure including excessive deflection
 - c. Fastener failure
 - d. Finish failure

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2.03 FABRICATION

- A. Comply with indicated profiles, dimensioned requirements and structural requirements.
- B. Use sections true to details with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.
- C. All welding to be done by heli-arc process.
- D. Bents shall consist of shop welded one piece units; concealed mechanical joints are not permissible; provide interior deflectors at drain post outlet locations.
- E. Provide flashing and counterflashing of like metals where indicated in the drawings.
- F. Roof Deck: Extruded Aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'-0" to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.
- G. Expansion joints, design structure for thermal expansion and contraction. Provide expansion joints as required.
- H. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.
- I. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.
- J. Install adequate drain boots at ends of door canopies.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle covered walkway system components as recommended by manufacturer. Handle and store in a manner to avoid deforming members and to avoid excessive stresses.

3.02 EXAMINATION

- A. Examine adjacent work for conditions that would prevent quality installation of system

3.03 CONCRETE FOOTINGS

- A. Concrete footings are not work of this section. Refer to Section 03300 and drawings.
- B. Sleeves (styrofoam blockouts) shall be furnished by walkway cover manufacturer and placed by general contractor.

3.04 FIELD DIMENSIONS

- A. Contractor shall field confirm bent locations, dimensions and elevation of junctures with existing buildings and tie-ins to existing canopies; show on shop drawings prior to fabrication. Contractor shall field verify any measurements needed by fabricator.

3.05 INSTALLATION

- A. Erection: Set roof support frames (bents) into pockets provided in top of footings; set to required elevations, align, plumb and level; and grout in place with 2,000 p.s.i. Portland cement grout. Assure that grout fills all voids and "keys" to columns. Fill downspout units with grout to bottom of discharge level. Install aluminum deflectors after grouting. Follow manufacturer's instructions. Match to finish and elevation of adjacent sidewalls.
- B. Install roof deck sections, accessories and related flashings in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.
- C. Assemble all components in a neat, workmanlike manner.

3.06 SUPPORT RODS AND BEARING ANGLES

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Extruded Aluminum Walkway Covers

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- A. Provide and coordinate reinforcement plates for setting within wall assembly; anchor plates shall not be exposed.
- B. Install appropriate anchors at support bearing angles and required blocking and anchoring angles.

3.07 FLASHING

- A. Flashings: Flashings are required between and within covered walkway system and adjoining structures, and are work of this section.

3.08 CLEANING AND PROTECTION

- A. Damaged Units: Replace roof deck panels and other components of the work which have been damaged or have deteriorated beyond successful minor repair.
- B. Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain a clean condition during construction.
- C. Protection: Advise Contractor of protection and surveillance procedures, as required to ensure that work of this section will be without damage or deterioration at time of substantial completion.

END OF SECTION

Section 10 80 00 Toilet and Bath Accessories

Specifications

10 80 00-1

PART 1 GENERAL

- 1.01 SECTION INCLUDES
 - A. Stainless steel mirrors, electric hand dryers, grab bars, and /waste receptacles, soap dispensers, toilet paper holders.
 - B. Owner provided/Contractor installed paper towel dispensers, soap dispensers
 - C. Attachment hardware.
- 1.02 REFERENCES
 - A. ADAAG - American with Disabilities Act Accessibility Guidelines.
- 1.03 SUBMITTALS
 - A. Submit under provisions of Section 01 30 00.
 - B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
 - C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
 - D. Conform to ADAAG code for access for the handicapped.
- 1.04 COORDINATION
 - A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

PART 2 PRODUCTS

- 2.01 MANUFACTURERS
 - A. Bradley Corporation
 - B. Other acceptable manufacturers offering equivalent products.
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. ASI.
 - C. Substitutions: Under provisions of Section 01 60 00.
- 2.02 MATERIALS
 - A. Sheet Steel: ASTM A366.
 - B. Stainless Steel Sheet: ASTM A167 Type 304.
 - C. Tubing: ASTM A269 stainless steel.
 - D. Fasteners, Screws, and Bolts: Hot dip galvanized steel, tamper-proof.
 - E. Expansion Shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate.
- 2.03 FABRICATION
 - A. Weld and grind joints of fabricated components smooth.
 - B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.
 - C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Form bar with 1 1/2 inches clear of wall surface.
 - D. Shop assemble components and package with anchors and fittings.
 - E. Provide steel anchor plates, adapters, and anchor components for installation.
- 2.04 FINISHES
 - A. Stainless Steel: Brushed finish at grab bars.
 - B. Back paint components where contact is made with building finishes to prevent electrolysis.
 - C. Grab bars to have peened grip, with concealed fasteners.
 - D. Mirrors to have channel-framed perimeter with 14 gauge, 304 satin finish with concealed mounting hardware. Mirror face to be 20 gauge type 304 stainless steel with no. 8 mirror polish finish.

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Toilet and Bath Accessories

Specifications

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2.05 SIZES/PRODUCT STYLES

- A. Mirrors: Re: drawings for sizes
- B. Grab Bars: Re: drawings for lengths.
- C. Double Toilet Paper Holders: locations and quantity indicated in drawings

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify exact location of accessories for installation.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions and ADAAG.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. See drawings for product numbers and locations.
- D. Installation of Surface Mounted Paper Towel Disp./Recept. shall be mounted for ADAAG compliance; top of wall opening at 4'-11" aff.

3.04 SCHEDULE

- A. Mirrors: (1) at each restroom lavatory
- B. Grab Bars: (1) 24" and 42" at each HC stall and each toilet room
- C. Toilet Paper Holders: (1) at each toilet
- D. Surface Mtd. Paper Towel Dispenser: locations and quantity indicated in drawings
- E. Surface Mtd. Soap Dispenser: locations and quantity indicated in drawings

END OF SECTION

Section 11 68 36

Tie-Back Netting

Specifications

11 68 36-1

PART 1- GENERAL

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein. Athletic equipment shall include, but not be limited to:
 - 1. Tie-Back Tension Ball Safety Netting System and Posts

1.02 RELATED WORK

- A. Examine contract documents for requirements that affect work of this section. Other specification divisions and sections that directly relate to the work of this section include, but are not limited to:
 - 1. Division 03 – Concrete; Sections: Cast-in-Place Concrete
 - 2. Division 31 – Earthwork; Sections: Excavation and Backfill and Establishment of Sub-Grade Elevations
 - 3. Division 32 – Exterior Improvements; Sections: Athletic and Recreational Surfacing, Concrete, Asphalt and Site Improvements

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. National Federation of State High School Associations (NFHS)
 - 2. National Collegiate Athletic Association (NCAA)
 - 3. International Association of Athletics Federations (IAAF)
 - 4. American Sports Builders Association (ASBA)
 - 5. Manufacturers Data and Recommended Installation Requirements

1.04 SUBMITTALS

- A. Manufacturers Product Data
 - 1. Provide manufacturers product data prior to actual field installation work, for Architects or Owners representatives review.
- B. Shop Drawings
 - 1. Provide drawings of the manufacturers recommended installation and foundation requirements prior to actual field installation work, for Architects or Owners representatives review.

1.05 QUALITY ASSURANCE

- A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements. The Manufacturer shall have a current American Sports Builders Association (ASBA) Supplier Certificate of Distinction designation.

1.06 PRODUCT DELIVERY AND STORAGE

- A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owners representative. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule. Sound materials shall be stored

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Tie-Back Netting

Specifications

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above ground under protective cover or indoors so as to provide proper protection.

PART 2 - PRODUCTS

2.01 Tie-Back Tension Ball Safety Netting System with Posts

A. Basis of Design:

1. Sportsfield Specialties, Inc
 - a. TNTBUC – Tie-Back Tension Ball Safety Netting System with Ultra Cross Netting and Dyneema® Rope with Posts

2. ~~Other Acceptable Manufacturers:~~

- ~~a. Beacon Athletics~~
 - ~~i. Outboard Tie-Back Backstop Netting System with Posts~~

B. COMPONENTS:

1. Tie-Back Tension Ball Safety Netting System Upright Support Posts and/or Tie-Back Structures – Fabricated, Sized and Configured as Required:
 - a. Height Above Finish Grade as Required
 - b. Super Durable Powder Coated Black Finish with Enhanced Resistance to UV and Fade
 - c. Base Plate Mount.
 - d. Hot Dipped Galvanized Assembly Hardware - Quantities, Sizes and Configurations as Required
 - e. Posts to have welded attachment points.
2. Tie-Back Tension Ball Safety Netting System Dyneema® Rope Support Structure:
 - a. Sizing, Length, Height and Configuration as Required
 - b. EverSteel™-X Dyneema® Rope:
 - a. Fiber: Dyneema®
 - b. Color: Black
 - c. Construction:
 - i. Dyneema® Max DM20 Technology
 1. Achieves superior creep performance
 2. Optimal for long-term static loads
 - ii. Torque-Free, 12-Strand Single Braid
 - iii. Extremely Low Stretch and Superior Flex Fatigue and Wear Resistance
 - d. Elastic Elongation
 - i. 0.30% Elongation @ 10% of Break Strength
 - ii. 0.55% Elongation @ 20% of Break Strength
 - iii. 0.80% Elongation @ 30% of Break Strength
 - c. EverSteel-X™ Dyneema® Rope - 3/4" Diameter Main Horizontal Support, 61,400 lb. Minimum Breaking Strength, 20,466 lb. Minimum Working Load Limit
 - d. EverSteel-X™ Dyneema® Rope - 1/2" Diameter Tie-Back Support, 28,700 lb. Minimum Breaking Strength, 9,566 lb. Minimum Working Load Limit
 - e. 7 x 19 GAC Galvanized Aircraft Cable - 1/4" Diameter Vertical and Bottom Horizontal Supports, 7,000 lb. Minimum Breaking Strength, 2,333 lb. Minimum Working Load Limit

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- f. Hot Dipped Galvanized Attachment and Assembly Hardware - Quantities, Sizes and Configurations as Required
- 3. Tie-Back Tension Ball Safety Netting System Net and Rope Bound Border:
 - a. Length, Height and Configuration as Required
 - b. Ultra Cross Knotless Netting
 - c. Dyneema® Ultra-High Molecular Weight Polyethylene (UHMWPE) SK 75 Black Fiber Construction
 - d. 4 Ply, 1.2 mm (0.0472") Diameter Twine
 - e. 95% Open Mesh Area (See-Through Visibility)
 - f. 58,445 psi Minimum Breaking Strength
 - g. 30% Maximum Elongation at Break
 - h. 1-3/4" (44 mm) Square Mesh Size, 0.009 lbs. per Square Foot
 - i. 4-Strand, Braided, Continuous Monofilament Dyneema® Fiber
 - j. Black Multi-Filament Polypropylene Solid Braid Derby Rope Sewn Binding on Perimeter Edges - 1/4" Diameter, 530 lb. Minimum Breaking Strength
 - k. Urethane Black Bonded Finish
 - i. Field Green Finish Available Upon Request
 - l. Strong Resistance to Ultraviolet (UV) Light Degradation
 - m. Excellent Resistance to Chemicals and Water Absorption
- 4. Included Accessories:
 - a. Hot Dipped Galvanized Attachment and Assembly Hardware - Quantities, Sizes and Configurations as Required
 - b. Black Rope for Net Binding Attachment to Rope Support Structure – Quantities and Configurations as Required
 - c. Stamped and Sealed Drawings with Foundation design and Calculations by a Licensed Professional Engineer of Record in the State of Louisiana.
 - d. Model Specific Hardware Kit and Installation Instruction
 - e. One (1) Year Limited Manufacturer's Product Warranty

PART 3 - EXECUTION

3.01 INSTALLATION OF EQUIPMENT

- A. All TNTBUC Tie-Back Tension Ball Safety Netting Systems with Ultra Cross Netting and Dyneema® Rope shall be installed as recommended per manufacturer's written instructions and as indicated on the drawings. Concrete anchoring foundations to be determined by others based on local soil conditions and building codes. Installer should have a minimum of five (5) ball safety netting system installations or similar experience in the previous three (3) years.

END OF SECTION

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PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Fixed Seating plastic - padded plastic chairs with self-rising seat mechanisms, aisle and intermediate standards.
 - 1. Typical applications include the following:
 - 1. Straight stadium seating.
 - 2. Floor mounted chairs.
 - 3. Riser mounted chairs.
- B. Alternates: This section specifies alternates for audience seating products. Refer to Part 2 products for alternate products, and to Division 1 Alternates sections and other bid documents, if any, for alternate requirements.
- C. Product Improvements: Hussey Seating Company strives to continuously improve its products and manufacturing methods. The company reserves the right to make changes without notice when, in the opinion of the company, such changes improve the product or its performance.

1.02 REFERENCES

- A. National Fire Protection Association (NFPA)
 - 1. NFPA 102 Standard for Assembly Seating, Tents and Membrane Structures.
- B. American National Standards Institute (ANSI).
- C. American Society for Testing Materials (ASTM)
 - 1. ASTM - Standard Specification for Properties of Materials.
- D. Americans with Disability Act (ADA)
 - 1. ADA - Standards for Accessible Design.

1.03 MANUFACTURER'S SYSTEM ENGINEERING DESCRIPTION

- A. Structural Performance: Engineer, fabricate and install stadium and arena seating to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connection. Apply each load to produce maximum stress in each respective component of each audience seat unit.
- B. Manufacturer's System Design Criteria:
 - 1. Seats and Backs:
 - 1. Shall embody a timeless sculptured appearance to harmonize with any architectural form or room decor.
 - 2. Shall exhibit moderate compound contours for supportive comfort avoiding excess anatomical pressures.
 - 3. Seats shall be semi-cantilevered, self-centering, automatic three quarter (3/4) lift with over center retract feature, for ease of passage and janitorial access.
 - 4. Seat shall be tested and professionally certified through an independent testing laboratory to support and withstand an evenly distributed 600 lb [272.1Kg] static load without failure or irregularities that would impair usefulness.
 - 5. Self lifting seat shall be tested and professionally certified through an independent testing laboratory to withstand 350,000 operating cycles without added lubrication, spring fatigue, adjustment, or measurable bearing wear.
 - 6. Seat shall be tested and professionally certified to withstand, without failure, 1000 impacts, of a 40 pound [18.14Kg] sandbag dropped on center of seat from each of the following heights of 6 inches [152mm], 8 inches [203mm], 10 inches [254mm], 12 inches [305mm] at a rate of 18 impacts per minute for a total of 4000 impacts.
 - 7. Back shall withstand an evenly distributed front or rear static load of 450 lbs [204.1Kg].
 - 8. Backs shall be tested and professionally certified to withstand, without failure, 40,000 swinging impacts each to the front and rear of the back by means of two opposing 40 pound [18.14Kg] sandbags. The sandbags shall be moved

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horizontally and equally for 10,000 cycles each at the following distances of 6 inches [152mm], 8 inches [203mm], 10 inches [254mm], and 12 inches [305mm] at a rate of 35 cycles per minute.

9. Horizontal Traverse Static Load to Back: Backs shall withstand an evenly distributed static load of 200 lbs [90.70Kg] to the top of the back at a 45 degree angle to the row of seats.
10. Armrests shall be tested and professionally certified to withstand an evenly distributed static load of 200 pounds [90.70Kg] applied perpendicular to the armrest.
2. Materials (Flammability) shall satisfy applicable test, codes, standards, or requirements as follows:
 1. Polyethylene shall meet the Federal Motor Vehicle Safety Standard No. 302 which specifies a burning rate of less than 4 inches [102mm] per minute.

1.04 SUBMITTALS

- A. Section Cross-Reference: Submit required submittals in accordance with "Conditions of the Contract" and Division
 1. General Requirements sections of this "Project Manual."
- B. Project Data: Manufacturer's product data for each system. Include the following:
 1. Project list: Ten (10) seating projects of similar size, complexity and in service for at least five (5) years.
 2. Deviations: List of deviations from these project specifications.
- C. Shop Drawings: Indicate plastic chair seating layout. Show all equipment to be furnished with details of accessories to be supplied including necessary electrical service to be provided by others.
- D. Samples: Seat materials and color finish as selected by Architect from manufacturers standard color finishes.
- E. Manufacturer Qualifications: Certification of insurance coverage and manufacturing experience of manufacturer.
- F. Installer Qualifications: Installer qualifications indicating capability, experience, and manufacturer acceptance.
- G. Engineer Qualifications: Certification by a professional engineer, registered in the state of manufacturer, that the equipment to be supplied meets or exceeds the design criteria of this specification.
- H. Operating/Maintenance Manuals: Provide to Owner maintenance manuals. Demonstrate operating procedures.
- I. Warranty: Manufacturers standard warranty documents.

1.05 QUALITY ASSURANCE

- A. NFPA Standard: Comply with current NFPA 102 Standard for Assembly Seating, Tents and Membrane Structures, except where additional requirements are indicated or imposed by authorities having jurisdiction.
- B. Welding Standards & Qualification: Comply with AWS D1.1 Structural Welding Code - Steel and AWS D1.3 Structural Welding Code - Sheet Steel.
- C. Insurance Qualifications: Mandatory that each bidder submit with his bid an insurance certificate from the manufacturer evidencing the following insurance coverage:
 1. Workers Compensation - including Employers Liability with the following limits:
 1. \$500,000.00 Each Accident
 2. \$500,000.00 Disease - Policy Limit
 3. \$500,000.00 Disease - Each Employee
 2. Commercial General Liability - including premises/ operations, independent contractors and products completed operations liability. Limits of liability shall not be less than \$2,000,000.00

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- D. Manufacturer Qualifications: Manufacturer who has ten (10) years of experience manufacturing spectator seating equipment.
- E. Installer Qualifications: Engage experienced Installer who has specialized in installation of audience seating similar to types required for this project and who is acceptable to, or certified by, spectator seating manufacturer.
- F. Engineer Qualifications: Engage professional licensed engineer experienced in providing engineering services of the kind indicated that have resulted in the successful installation of audience seating similar in material, design, fabrication, and extent to those types indicated for this project.
- G. All seats are manufactured to exceed industry standards free from any defects (weld, splatter, paint runs, squeaks, etc.).

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver audience seating in manufacturers packaging clearly labeled with manufacturer name and content.
- B. Handle seating equipment in a manner to prevent damage.
- C. Deliver the seating at a scheduled time for installation that will not interfere with other trades operating in the building.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Coordinate actual dimensions of construction affecting audience seating installation by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

1.08 WARRANTY

- A. Manufacturer's Product Warranty: Submit manufacturer's standard warranty form for fixed plastic chairs. This warranty is in addition to, and not a limitation of other rights Owner may have under Contract Documents.
 - 1. Warranty Period: One year from Date of Substantial Completion.
 - 2. Beneficiary: Issue warranty in legal name of project Owner.
 - 3. Warranty Acceptance: Owner is sole authority who will determine acceptance of warranty documents.

1.09 MAINTENANCE AND OPERATION

- A. Instructions: Both operation and maintenance shall be transmitted to the Owner by the manufacturer of the seating or his representative.
- B. Service: Maintenance and operation of the seating system shall be the responsibility of the Owner or his duly authorized representative, and shall include the following:
 - 1. Only attachments specifically approved by the manufacturer for the specific installation shall be attached to the seating.
 - 2. An annual inspection and required maintenance of each seating system shall be performed to assure safe conditions. At least biannually the inspection shall be performed by a professional engineer or factory qualified service personnel.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Interkal
 - 1. Product: Interkal Stadium Seat
 - 2. Model: Aura Slat-Back Chair – 22" wide
 - 3. Back Type: Plastic; Slatted.
 - 4. Seat Type: Plastic; simulated slatted - padded.
 - 5. Armrest Type: Integral scrolled cast iron.

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6. Standards: Cast iron riser mount and floor mount per plans and sections.
7. End Panels: Cast aluminum, with plate for row lettering
8. Product Accessories: Seat numbers, Row letters, Logos, Cupholders, & Companion chair, Roll Away chairs, Removable chairs.

2.03 MATERIALS

- A. Cast Iron: ASTM A48, and ASTM A536.
- B. Steel Plates, Shapes, and Bars: ASTM A570.
- C. Drilled-in Expansion Anchors: SAE grade 2
- D. Blow molded Plastic: Virgin high density polyethylene with a melt index of 0.40 per ASTM D1238.

2.04 FABRICATION

- A. (Outdoor) Open slat back shall be a one piece double wall blow molded polyethylene with smooth surface, anti-static compound, and ultra-violet light stabilizing additives. Open slats shall span horizontally between each side of the back and be clearly open and separated from adjacent slots. Back shall have moderate compound contours for supportive comfort avoiding anatomical pressures. Back shall have nostalgic styling.
- B. (Outdoor) Simulated slat seat shall have a smooth surface for easy cleaning and be constructed of double wall blow molded polyethylene plastic with anti-static compounds and ultra-violet light stabilizing additives. Seat shall have a nominal wall thickness of 0.125 inch [3mm] and be ergonomically contoured for posture and sitting comfort. The seat shall have simulated slats and nostalgic styling.
- C. Seats shall be direct fastened to hinge arms by means of four threaded fastening screws. No exposed fasteners shall be located on seat surfaces.
- D. Back height to be 32 inches [813mm] from deck and extend below seat to afford chair occupant protection from rear and eliminate any pinching hazard. Back length shall not be less than 21 inches[533mm].
- E. Backs shall be recessed to receive aluminum number plates. Plates fitted in vandal resistant recess secured with two (2) rivets.
- F. Backs shall be fastened to standards at four (4) connection points, providing a back pitch of 15 degrees.
- G. Seat Hinge Arms.
 1. Seat hinge arms are recessed into both sides of the seat and follow the contour of the seat. The hinge arms provide the pivot connections and support the plastic seat.
 2. Seat hinge arm material shall be cast iron.
 3. Hinge arm shall be T.G.I.C. powder coated to match stanchion.
- H. Seat Hinge Mechanism.
 1. Each seat to be furnished with two (2) independent hinges and two (2) dual function spring lift mechanisms. Return lifter springs and stops shall be enveloped and concealed by the seat and seat hinge arms, to protect from dirt, dust, and not interfere with occupants' clothing, etc.
 2. Hinge arms shall rotate on pivot shaft fitted with permanently lubricated iron oil impregnated bearings.
- I. Cast Iron Standards:
 1. Standards shall be cast from Class 25 gray iron and be capable of withstanding American society of Testing Materials Transverse Test. Standards shall be designed to be fitted with decorative end panels in accordance with seating plan.
 2. Scrolled armrest shall be integral to the cast iron standard and shall have a smooth finished surface.
- J. Floor mount standards shall be rigidly attached to the floor at not less than two (2) mounting points and shall be designed to accommodate floor slopes, as required.
- K. Riser mount standards shall be rigidly attached to riser at not less than two (2) mounting points, and shall be designed to maintain a constant seat height from the floor. Proper back pitch shall also be maintained regardless of riser height.

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- L. Redirected seating shall be achieved without the use of shims. Standards shall be cast with built in offset to direct the seat, back and seating hinge toward home plate.
- M. Finishes:
 - 1. Cast Iron Finish: Cast iron shall be pre-treated and have the primer applied through a 15-stage dip immersion process. Primer will be a cathodic epoxy electrodeposition coat (E coat) applied to a minimum dry film thickness of 0.8 mils. Powder topcoat will be suitable for exterior applications, contains ultra-violet light stabilizers and applied over primed cast iron. This powder will be TGIC polyester and properly cured per the manufacturer's recommendation to a minimum dry film thickness of 6.0 mils. The performance of the powder will pass the 2H Pencil Hardness test (ASTM D3363) and 1500 hours of Salt Spray (ASTM B117a).
 - 2. (Outdoor) Plastic: Shall be blow molded polyethylene plastic with ultra-violet light stabilizing additives pigmented in one of the manufacturer's twenty-two (22) standard color offerings.
 - 3. Color: Shall match existing. Seating Contractor shall submit color samples for owner's approval prior to manufacture.
- 2.05 FASTENINGS
 - A. Chair Assembly
 - 1. All welds shall be made at the factory by welders that are certified on the equipment and process used.
 - 2. (Outdoor) All structural connections shall be made with 300 series stainless steel bolts, washers and nuts. Bolts shall be applied with a nylon patch lock to prevent loosening.
 - B. Concrete Floor Attachment
 - 1. Chair stanchions shall each be attached by means of two 1/4"[6mm] mechanical wedge anchors set in holes drilled to a minimum depth of 2"[50mm] in the concrete.
 - a. Wedge anchors shall be tested to ASTM E488 criteria and listed by ICBO and SBCCI. Wedge anchors feature a type 18-8 stainless steel split expansion ring and a threaded stud bolt body and integral cone expander, and a nut and washers. Stanchion shall be placed on the bolts, stanchions to be permanently secured with a flat washer, lock washer and nut.
 - C. Concrete Riser Attachment
 - 1. Chair stanchions shall each be attached by means of two 3/8"[10mm] threaded rods secured into concrete with a fast curing acrylic adhesive. Adhesive and rods are set in holes drilled to a minimum depth of 2 1/2"[64mm] in the concrete.
 - 2. Threaded rods shall be of approved type with zinc-plate finish or made of stainless steel to suit environmental conditions.
 - 3. Acrylic Adhesive shall be in conformance with ASTM Type IV, Grade 3, and covered by ICBO evaluation.
 - 4. Stanchion to be placed on the bolts, stanchions to be permanently secured with a flat washer, lock washer and nut.
- 2.06 ACCESSORIES
 - A. Chair numbers shall be black numerals etched on an elliptical aluminum plate. Number plates to be located in vandal resistant recess in the top of back, and secured using two (2) rivets.
 - B. Row letters shall be black numerals etched on an elliptical aluminum plate. Letter plates shall be located on a raised and centered casting surface provided on the end standard for easy viewing. Letter plates shall be secured in a vandal resistant recess and secured using two (2) rivets.
 - C. ADA Armless Standard (Floor Mount Stanchion only): End standard shall have no armrest to allow easy side access for disabled patrons. Armless standards shall be provided for 1% of the fixed seating capacity to meet the Americans with Disabilities Act (ADA). Available in floor mount standards only.
 - D. Easy Access Armrest (Floor Mount Stanchion only): Armrest shall hinge on aisle end stanchions to allow easy side access for disabled patrons. Flip-up armrest stanchions shall be provided for

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1% of the fixed seating capacity to meet the American with Disabilities Act (ADA). Each accessible chair shall include the universal handicap symbol on the end aisle stanchion for clear identification. Disperse easy access armrests throughout the seating as shown on the seating plans.

- E. Removable Chairs: Provide chairs to be floor mounted and ganged in groups of one, two, or three chair units for easy removal. Chair standards shall be mounted to a painted steel skid base. Skid base with chairs shall be easily removed from the concrete floor by means of flush mounted internally threaded expansion anchors positioned under each leg of the skid. When removed, the anchor holes are filled by flat head bolts to provide a flat surface and prevent dirt and debris from entering.
- F. Roll-Away Chairs: Provide removable two or three chair modules supported on a tubular steel support frame with heavy duty casters. Chair modules shall be easily removed and stored to create single and double wheelchair spaces respectively. Chairs shall utilize standard fixed seating seats and backs in order to maintain a consistent appearance along the seating row.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify area to receive audience seating are free of impediments interfering with installation and condition of installation substrates are acceptable to receive audience seats in accordance with seating manufacturer's recommendations. Do not commence installation until conditions are satisfactory.

3.02 INSTALLATION

- A. Manufacturer's Recommendations: Comply with seating manufacturer's recommendations for product installation requirements.
- B. General: Install fixed audience seating in accordance with manufacturer's installation instructions and final shop drawings. Provide accessories, anchors, and assembly hardware for installation of seating and for permanent attachment to adjoining construction.

3.03 ADJUSTMENT AND CLEANING

- A. Adjustment: After installation completion, all equipment is to be adjusted for smooth and proper operation.
- B. Cleaning: Clean work area and remove debris from site.

3.04 PROTECTION

- A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer to ensure audience seats are without damage or deterioration at time of substantial completion.
- B. Finish Touch-up: Touch-up original manufacturer's finish coating with an approved touch-up paint whenever damage has occurred during shipment or installation. Color match the original manufacturer's color.

END OF SECTION

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Electric Traction Passenger Elevators

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PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Electric traction passenger elevators.

1.02 RELATED SECTIONS

- A. Section 015000 – Temporary Facilities and Controls: Protection of floor openings and personnel barriers; temporary power and lighting.
- B. Section 033000 – Cast-in-Place Concrete: Elevator pits.
- C. Section 036000 – Grouts (Grouting): Grouting door frames and sills.
- D. Section 042000 – Masonry Units (Unit Masonry): Setting sleeves, inserts, and anchoring devices in masonry for guide-rail brackets.
- E. Section 051200 – Structural Steel (Structural Steel Framing): Support steel, divider beams, and hoist beams.
- F. Section 055000 – Metal Fabrications: Pit ladders, supports for entrances in drywall hoistways.
- G. Section 061000 – Rough Carpentry: Temporary platform assembly.
- H. Section 092916 – Gypsum Board: Hoistway walls.
- I. Section 099000 – Paints and Coatings (Painting and Coating): Field painting of elevator entrances over primer.
- J. Section 221429 – Sump Pumps: For sump pumps, sumps, and sump covers in elevator pits.
- K. Section 230000 – Heating, Ventilating, and Air Conditioning Equipment (Heating, Ventilating, and Air-Conditioning (HVAC)): Heating, cooling, and ventilation of control and machinery space.
- L. Section 260500 – Wiring Methods (Common Work Results for Electrical): Light outlets, convenience outlets, light switches, and conduits.
- M. Section 262400 – Switchboards, Panelboards, and Control Centers (Switchboards and Panelboards): Disconnect switches.
- N. Section 265000 – Lighting: Light Fixtures
- O. Section 271500 – Communications Horizontal Cabling: For telephone service for elevators and for internet connection to elevator controllers for remote monitoring.
- P. Section 273000 – Telephone and Intercommunication Equipment (Voice Communications): Telephone outlets and elevator telephones.
- Q. Section 283100 – Detection and Alarm (Fire Detection and Alarm): Heat, smoke, and products of combustion sensing devices, fire alarm signal lines to contacts in machine space.

1.03 REFERENCES

- A. ANSI/ASME A17.1/CAN/CSA B44 – Safety Code for Elevators and Escalators.
- B. ADAAG – Americans with Disabilities Act Accessibility Guidelines.
- C. ANSI/NFPA 70 – National Electrical Code.
- D. ANSI/NFPA 80 – Fire Doors and Windows.
- E. ANSI/UL 10B – Fire Tests of Door Assemblies
- F. CAN/CSA C22.1 – Canadian Electrical Code.
- G. Model and Local Building Codes. ISO 9001: 2000 – Quality Management Systems – Requirements.

1.04 DESIGN REQUIREMENTS

- A. Arrange elevator components in control closet or machinery space so equipment can be removed for repairs or replaced with minimal disturbance to other equipment and components.
- B. Where permitted by code, provide all elevator equipment including controls, drives, transformers, and rescue features within elevator hoistway.

1.05 SUBMITTALS

- A. Comply with Section 013300 (01 33 00) – Submittal Procedures.
- B. Product Data: Submit manufacturer/installer's product data, including:
 - a. Descriptive brochures or detail drawings of car and hall fixtures, cab ceilings, and product features.
 - b. Power Information: Horsepower, starting current, running current, machine and control heat release, and electrical requirements.

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Electric Traction Passenger Elevators

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- C. Shop Drawings: Submit manufacturer/installer's shop drawings, including plans, elevations, sections, and details, indication location of equipment, loads, dimensions, tolerances, materials, components, fabrication, fasteners, hardware, finish, options, accessories, and other information to render functional elevators.
- D. Samples: Submit manufacturer/installer's samples of standard colors and finishes of finished materials.
- E. Operation and Maintenance Manual: Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogs; and electrical wiring diagrams.
- F. Warranty: Submit manufacturer/installer's standard warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer/Installer's Qualifications: Specialize in manufacturing and installing elevator equipment, with a minimum of 10 years of successful experience.
- B. Regulatory Requirements:
 - a. Elevator design, clearances, construction, workmanship, materials, and installation, unless specified otherwise, shall be in accordance with ANSI/ASME A17.1, handicap accessibility, Americans with Disabilities Act, and other codes having legal jurisdiction.
 - b. ANSI/ASME A17.1 shall govern, except where codes having legal jurisdiction include more rigid requirements or conflict with ASNI/ASME A17.1 and other codes having legal jurisdiction.
 - c. Elevator shall follow design and manufacturing procedures certified in accordance with ISO 9001-2000 to meet product and service requirements for quality assurance for new products.
 - d. Where product is in variance to the published ASNI/ASME A17.1 model code, provide a 3rd party AECO certification demonstrating equivalent function, safety, and performance.
- C. Pre-installing Meeting:
 - a. Convene pre-installation meeting before start of installation of elevators.
 - b. Require attendance of parties directly affecting work of this section, including Contractor, Architect, and elevator manufacturer/installer.
 - c. Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer/installer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer/installer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer/installer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

1.08 PROJECT CONDITIONS

- A. Temporary Electrical Power:
 - a. Arrange for temporary 220 VAC, single-phase, 60Hz., GFCI-protected electricity to be available for installation of elevator components.
- B. Installation of the Elevator:
 - a. General Contractor will provide permanent three-phase power prior to installation start.
 - b. General Contractor will provide clear, rollable access to a 20' x 10' secure and dry storage area prior to delivery.
 - c. General Contractor will provide a clean, dry, and complete hoistway along with temporary installation platform and all required OSHA-compliant barricades prior to delivery.
- C. Temporary Use of Elevator:
 - a. Owner will negotiate with manufacturer/installer for temporary use of elevator, if required.
 - b. Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

1.09 SCHEDULING

- A. Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays.

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Electric Traction Passenger Elevators

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1.10 WARRANTY

- A. Manufacturer/Installer shall guarantee materials and workmanship of equipment installed under these specifications and make good, defects not due to ordinary wear or to improper use, which may develop within 1 year after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

1.11 MAINTENANCE SERVICE

- A. Elevator maintenance service shall be performed by elevator manufacturer/installer.
- B. Elevators shall receive regular maintenance on each unit for period of 12 months after completion of work specified herein or acceptance thereof by beneficial use, whichever is earlier.
- C. Trained employees shall make periodic examinations and perform work including necessary adjusting, greasing, oiling, and replacing parts to keep elevators in operation, except parts that require replacement because of accidents, vandalism, misuse, or negligence by parties other than manufacturer/installer.
- D. Manufacturer/Installer shall perform all Work, except emergency minor adjustment call-back service, during regular working hours. Manufacturer/Installer shall provide emergency minor adjustment call-back service, during regular working hours.
- E. Should Owner request that examinations, cleaning, lubrication, adjustments, repairs, replacements, or emergency minor adjustment call-back service, unless specified herein, be performed on other than manufacturer/installer's regular working hours of regular working days, manufacturer/installer shall absorb straight-time labor charges and Owner will compensate manufacturer/installer for overtime premium, travel time, and expense at normal billing rates.
- F. Elevator Control System:
 - a. Include built-in remote diagnostic module to relay constant status of elevators and control system to a 24-hour, 7-days-a-week central-monitoring facility.
 - b. Remote Monitoring Device: Transmit information on current status of elevators, including malfunctions, system errors, and shutdown.

PART 2 – PRODUCTS

2.01 MANUFACTURER/INSTALLER

- A. Basis of Design: Schindler Elevation Corporation
- B. Equal products by the following manufacturers:
 - a. Otis
 - b. Thyssen Krupp

2.02 ELEVATOR SYSTEM AND COMPONENTS

- A. Electric Traction Passenger Elevators: Basis of design is the Schindler 3100 Gearless Traction Elevator.
- B. Elevator Equipment Summary:
 - a. Application: Machine Room Less (MRL)
 - b. Counterweight Location: Side
 - c. Machine Location: Top of the hoistway mounted on car and counterweight guide rails
 - d. Control Space Location: Top landing entrance frame or entrance frame at one floor below the top landing
 - e. Service: General Purpose Passenger
 - f. Quantity: 1 Unit
 - g. Capacity: 3500 lbs.
 - h. Speed: 100 fpm.
 - i. Travel: 23' 4"
 - j. Landings: 2
 - k. Front Openings: 2
 - l. Rear Openings: 2
 - m. Rear Door Hand: N/A
 - n. Operation: Microprocessor Single Car Automatic Operation
 - o. Clear Inside Dimensions: 6' 9-5/16" Wide X 5' 6-7/8" Deep
 - p. Cab Height: 7' 9"
 - q. Guide Rails: Equivalent to 12 lbs. per foot
 - r. Entrance Type and Width: Single Speed Center Opening 3' 6" Wide X 7' 0" High doors

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- s. Entrance Height: 7' 0"
- t. Power Supply: 208 Volts 3 Phase 60 Hz.
- C. Performance:
 - a. Car Speed: -10% to +5% of contract speed under any loading condition or direction of travel.
 - b. Car Capacity: Safely lower, stop and hold up to 125% of rated load per code.
- D. Ride Quality:
 - a. Vertical Vibration (maximum): 25 mg.
 - b. Horizontal Vibration (maximum): 15 mg.
 - c. Vertical Jerk (maximum): 2 ft/sec³
 - d. Acceleration (maximum): 1.6 ft/sec²
 - e. In Car Noise: 53-60 dB(A)
 - f. Stopping Accuracy: ±5 mm.
 - g. Starts per hour (maximum): 180
- E. Elevator Operation:
 - a. Simplex Collective Operation: Using a microprocessor based controller, operation shall be automatic by means of the car and hall buttons. When all calls have been answered, the car shall park at the last landing served.
 - b. Group Automatic Operation with Demand-Based Dispatching: Provide reprogrammable group automatic system that assigns cars to hall calls based on a dispatching algorithm designed to minimize passenger waiting time.
- F. Operating Features – Standard:
 - a. Door Light Curtain Protection
 - b. Static AC Drive
 - c. Phase Monitor Relay
 - d. Cab Overload with Indicator
 - e. Load-weighing
 - f. Central Alarm
 - g. Remote Monitoring
 - h. Firefighter's Operation
 - i. Automatic Evacuation
 - 1. When the main line power is lost for longer than 5 seconds, the emergency battery power supply provides power automatically to the elevator controller. If the car is at the first floor when the power fails, it remains at that floor, opens its door, and shuts down. If the car is between floors, it is raised or lowered to the first available landing, opens its doors, and shuts down.
 - j. Independent Service

2.03 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

- A. Controller: Provide microprocessor based control system to perform all of the functions of safe elevator operation, as well as perform car and group operational control.
 - a. All high voltage (110v or above) contact points inside the inspection and test panel shall be protected from accidental contact in a situation where the access panels are open.
 - b. The controller shall be distributed throughout the elevator system located in the overhead, cab, inspection, and test panel. The inverter will be mounted in the overhead adjacent to the hoist machine and an inspection and test panel will be located in the door jamb at the top floor or one floor below the top floor. No elevator equipment mechanical rooms or closets are required.
 - c. Provide multi-bus control architecture to reduce cabling, material, and waste.
- B. Drive: Provide a Variable Voltage Variable Frequency AC Closed Loop drive system. Provide stable start without high peak current, quickly reaching a low energy consumption level.
- C. Inspection and Test Panel: Integrated control equipment, main inspection, and test panel in door frame at top level served or at one floor below the top level served.

2.04 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine:
 - a. Gearless asynchronous AC motor with integral drive sheave, service, and emergency brakes.
 - b. Design machine to enable direct power transfer, thereby avoiding loss of power.

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- c. Design machine to compact, lightweight and durable to optimize material usage and save space.
 - d. Mount to structural support channels on top of guide rail system as applicable in hoistway overhead.
- B. Governor:
 - a. Tension type over-speed governor with remote manual reset.
 - b. Mount to structural support channels as applicable in hoistway overhead.
- C. Buffers, Car and Counterweight: Compression spring type buffers to meet code.
- D. Hoistway Operating Devices:
 - a. Emergency Stop switch in the pit.
 - b. Terminal stopping switches.
 - c. Emergency stop switch on the machine.
- E. Positioning system: System consisting of proximity sensors and door zone vanes.
- F. Guide Rails and Attachments: Provide Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual purpose bracket that combines both counterweight and guide rails, and one of the car guide rails to building fastening.
- G. Suspension System: Noncircular Elastomeric coated suspension media with high tensile grade steel cords.
- H. Governor Rope: Steel wire rope with 6 mm. diameter.

2.05 EQUIPMENT: HOISTWAY ENTRANCES

- A. Hoistway Doors and Frames:
 - a. UL rated with required fire rating.
 - b. Doors: Rigid flush panel construction with reinforcement ribs.
 - c. Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.
- B. Finish:
 - a. Exposed Areas of Corridor Frames: Stainless Steel – All Floors
 - b. Doors: Stainless Steel – All Floors
 - c. Sills: Aluminum – All Floors
- C. Entrance Markings and Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.06 EQUIPMENT: CAR COMPONENTS

- A. Car Frame and Safety: Provide car frame with adequate bracing to support the platform and car enclosure. The safety shall be integral to the car frame and shall be flexible guide clamp type.
- B. Platform: Provide platform of steel construction with plywood subfloor and aluminum threshold.
- C. Car Guides: Provide sliding guide shoes mounted to top and bottom of both car and counterweight frame. Arrange each guide shoe assembly to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
 - a. Provide central guiding system to reduce mechanical friction and energy consumption.
- D. Steel Cab:
 - a. Fire rating: Provide Class B Fire rating for cab, or Class A fire rating where required by local code.
 - b. Design cab to comply with LEED Indoor Environmental Quality requirements through use of Low-Emitting Materials on walls, ceiling, and subflooring.
 - c. Car wall finish: Steel Plastic Laminate Finish selected from manufacturer's standard selections.
 - d. Base and frieze: Aluminum.
 - e. Car front finish: Brushed Stainless Steel.
 - f. Car door finish: Brushed Stainless Steel.
 - g. Ceiling: Canopy ceiling, finished in #4 Stainless Steel With Down Lit LED Lighting. Provide lighting consisting of four compact fluorescent energy saving lights located in two semi-oval lateral cutouts located on the center-sides of the cab ceiling, Lexan lens cover.
 - h. Handrail: Rectangular Brushed Aluminum – Straight End. Locate on Side Walls.
 - i. Flooring: By others. Not to exceed 3/8" finished depth.
 - j. Ventilation: Provide one-speed fan in canopy.

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- k. Emergency Car Lighting: Provide an emergency power unit employing a 12 volt sealed rechargeable battery and static circuits to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
- l. Emergency Siren: Provide siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged.
- m. Emergency Exit Switch: Provide electrical contact to open the safety circuit when the emergency car top exit is opened. When the exit door is opened, the top exit switch shall signal the control, and the car will be unable to move.
- n. Emergency Exit Lock: Provide an emergency exit lock where required by local code.
- o. Emergency Exit Guard: Provide emergency exit guard on top of car when required for hoistway wall to platform clearance exceeds 12" or for multiple cars in hoistway.

2.07 DOOR OPERATOR AND REOPENING DEVICES

- A. Door Operator: Provide a closed loop VVVF high performance door operator with frequency controlled drive for fast and reliable operation to open and close the car and hoistway doors simultaneously.
- B. In case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Provide emergency devices and keys for opening doors from the landing as required by local code.
- C. Doors shall open automatically when the car has arrived or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. Provide door open button in the car operating panel. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Provide door hangers and tracks for each car and hoistway door. Contour tracks to match the hanger sheaves. Design hangers for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated seal for life bearings.
- E. Electronic Door Safety Device: Equip car doors with concealed transmitter and receiver infrared beam devices to detect presence of object in process of passing through hoistway entrance and car doorway (light curtain device).
 - a. Use multi-beam scanning without moving parts to detect obstructions in door opening.
 - b. Detector Device: Prevent doors from closing, or if they have already started closing, cause doors to reopen and remain open while object is within detection zone.
 - c. Horizontal Beams: Minimum of 33 infrared beams to fill doorway from ground level to a height of 6 feet.

2.08 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- A. Car Operating Panel: Provide a car operating panel with all push buttons, key switches and message indicators for elevator operation.
 - a. Full height car operating panel shall be surface mounted on front return.
 - b. Comply with handicap requirements.
 - c. Push Buttons: Mechanical, illuminating using long-lasting LEDs for each floor served.
 - d. Emergency Buttons: Provide in accordance with code. Emergency alarm button, door open and door close buttons.
- B. Features of the Car Operating Panel shall include:
 - a. Audible chime to signal that the car is either stopping at or passing a floor served by the elevator.
 - b. Raised markings and Braille provided to the left hand side of each button.
 - c. Car Lantern: Provide LED illuminated car lantern with direction arrows to comply with local code when hall lanterns are not provided.
 - d. Door open and close push buttons.
 - e. Firefighter's hat and Phase 2 key-switch
 - f. Inspection key-switch
 - g. Key-switch for optional Independent Service Operation
 - h. Illuminated alarm button with raised marking.
 - i. Elevator Data Plate marked with elevator capacity and car number.
 - j. Help Button: Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where

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personnel are available to take appropriate action. Visual indicators are provided for call initiation and call acknowledgement.

- C. Hall Fixtures: Provide hall fixtures with necessary push buttons and key-switches for elevator operation.
 - a. Push Buttons: Metallic tactile push buttons, up button and down button at intermediate floors, a single button at each terminal floor.
 - b. Height: Comply with handicap requirements.
 - c. Illumination: Illuminating using long-lasting low power LEDs.
- D. Hall Lanterns and Position Indicators:
 - a. LED illuminated direction arrows with audible and visible call acknowledgement.
- E. Hoistway access switches: Provide key-switch at top and/or bottom floor in entrance jamb as required by local code.
- F. Firefighter's Phase 1 Service: Key switch in brushed stainless steel cover plate.
- G. Fixture Cover Plates: For push buttons, hall lanterns and position indicators, resistant while back-printed glass, no screws required for mounting. Provide stainless steel cover plates for Firefighter's Phase 1 Switch and hoistway access switches, with tamper resistant screws in same finish.
- H. Mounting: Mount hall fixtures in entrance frames.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine hoistways, hoistway openings, and pits before starting elevator installation.
- B. Verify hoistway, pit, overhead, and openings are of correct size, within tolerances, and are ready for work of this section.
- C. Verify walls are plumb where openings occur and ready for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- D. Verify hoistway is clear and plumb, with variations not to exceed -0 to +1 inch at any point. Verify projections greater than 4" must be beveled not less than 75 degrees from horizontal. No negative tolerance is permitted for minimum hoistway dimensions.
- E. Verify minimum 2-hour fire-resistance rating of hatch walls.
- F. Notify Architect in writing of dimensional discrepancies or other conditions detrimental to proper installation or performance of elevators.
- G. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to manufacturer/installer.

3.02 INSTALLATION

- A. Install elevators in accordance with manufacturer/installer's instructions and ANSI/ASME A17.1.
- B. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.

3.03 FIELD QUALITY CONTROL

- A. Perform tests of elevator as required by ANSI/ASME A17.1 and governing codes.

3.04 ADJUSTING

- A. Adjust elevators for proper operation in accordance with manufacturer/installer's instructions.
- B. Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.
- C. Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.
- D. Adjust automatic floor leveling feature at each floor to within ¼ inch of landing.
- E. Repair minor damages to finish in accordance with manufacturer/installer's instructions and as approved by Architect.
- F. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.05 CLEANING

- A. Clean elevators promptly after installation in accordance with manufacturer/installer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

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3.06 PROTECTION

- A. Protect installed elevators from damage during construction in accordance with the negotiated temporary use agreement between Owner and manufacturer's installer.

END OF SECTION

SECTION 21 00 00 - FIRE PROTECTION GENERAL PROVISIONS



PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SYSTEM DESCRIPTION

- A. Fire protection system shall be a system employing automatic sprinkler heads attached to a piping system containing water and connected to an adequate water supply so that water discharges immediately from the sprinklers opened by fire.
- B. The fire protection system shall be the following:
 - 1. Standard-Pressure Sprinkler Piping: Automatic Wet-Pipe sprinkler system piping designed to operate at a working pressure of 175-psig maximum.
- C. The fire protection system shall be monitored by a fire alarm system.

1.3 DEFINITIONS

- A. Working Plans as used in this Section means those documents (including drawings and calculations) prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the authority having jurisdiction (AHJ).
- B. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).
- C. Refer to NFPA Standard 13 for additional definitions for fire protection systems.

1.4 SCOPE OF WORK

- A. Furnish all materials, labor, tools, equipment and working plans necessary to install and place into operation the complete fire protection portion of this Contract as called for on the accompanying drawings and as specified herein.
- B. Interlock the fire protection system with the fire alarm system monitoring. If there is no fire alarm being provided under work of Division 26 – Electrical, this contractor shall provide a fire alarm communicator panel in the vicinity of the sprinkler entry riser. Contractor shall interlock the supervised valves (Post indicator valve, OS&Y valves, tamper switch(es), flow switch(es), etc.) with the communicator panel. The contractor shall provide a phone line to the communicator panel. Contractor shall provide one year of monitoring. Contractor shall coordinate turn-over of the monitoring service with the owner. Contractor shall provide a complete and operable system as per specifications.
- C. Prior to start of the working plans of the fire protection system, the contractor shall coordinate and complete the "Owner's Information Certificate" form required by the State Fire Marshal. The form can be found at the State Fire Marshal's website <http://sfm.dps.louisiana.gov>. The

form shall identify special occupancies and commodity classifications and shall be given to the fire protection system designer before the start of design.

- D. Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- E. It is the intention of these specifications that all fire protection systems shall be furnished complete with all necessary valves, controls, insulation, piping devices, equipment, etc. necessary to provide a satisfactory installation that is complete and in good working order.
- F. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.
- G. This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.
- H. Contractor shall include in the bid all offsets required in order to avoid conflict with ductwork, lights, grilles, structure, water lines, cable trays, conduits, etc. Offsets shall be made above intersecting ducts or pipes in order to minimize trapping of water.
- I. Coordinate installation of piping with other trades to assure that the piping can fit in the space provided. In general, the sprinkler piping shall be run at maximum height above the finished floor or between joists in order to minimize conflict with other trades. Obtain latest plan of Architectural, Mechanical, Plumbing, Structural and Electrical before preparing finished drawings.
- J. Contractor shall obtain the latest flow data from the local utility water company and assure prior to bid that adequate water pressures and flow are available for the system intended to be provided.

1.5 DEMOLITION

- A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.
- B. Contractor shall coordinate demolition with owner. All equipment shall be salvaged for owner. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor's expense in a lawful manner.
- C. Contractor shall coordinate all work with general contractor and phase work as required by project.
- D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.
- E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.
- F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.

- G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.

1.6 BIDDING REQUIREMENTS AND RESPONSIBILITIES

- A. Each bidder shall be licensed to perform sprinkler work in the State of Louisiana and shall be recognized by the Property Insurance Association of Louisiana as a reliable sprinkler contractor.
- B. Prime bidder is responsible for all work, of all trades and sub-contractors bidding this project. It is the prime bidder's responsibility, prior to submitting a bid to ensure that sub-contractors coordinate all aspects of the work between trades, sub-contractors, etc. to the fullest extent possible.
- C. Prime bidder shall ensure that all sub-contractors, suppliers, equipment vendors, etc., obtain all necessary and pertinent contract document information pertaining to their work prior to the submission of a bid. Contractor shall realize that different sub-contractors may furnish equipment, accessories, devices, etc. necessary for a complete and working installation require provisions of services by another sub-contractor or trade.
- D. Bidders of all or any portions of this section or division are required to review all contract documents including but not limited to Architectural drawings, Structural drawings, Mechanical drawings, Plumbing drawings, Electrical drawings, etc. to coordinate requirements and responsibilities with and through prime bidder.
- E. Bidders of all or any portions of this section or division, by furnishing a bid on a portion of the prime contract are indicating that they have received all contract documents and coordinated services provided under their portion of the work with the prime bidder; they are indicating that they have expressed any pertinent questions (which would result from a detailed, thorough review of the entire set of contract documents) to the prime bidder in accordance with Division 00 & 01 requirements, prior to bidding.
- F. All timely, pertinent, questions provided in writing prior to bids, in accordance with Division 00 & 01 requirements, will be clarified, defined, or otherwise explained in a written addendum and/or addendums prior to bids, in accordance in Division 00 & 01 requirements.
- G. It is not the intention of these contract documents to leave any issue relating to coordination between trades or sub-contractors vaguely defined. The intention is to define all issues, coordination matters, equipment requirements, sizes, routing, etc. to the satisfaction of the prime bidder, prior to receipt of bids.
- H. Bidders of all or any portions of this section or division, by virtue of the submission of a bid to the prime bidder, are indicating that they have reviewed the entire set of contract documents with due diligence and regard for the Owner's desire for a comprehensive and complete bid proposal; that they have expressed all concerns or questions requiring clarification on matters of coordination between trades and/or sub-contractors; that they have expressed any such concerns or questions in writing in accordance with Division 00 & 01 requirements.
- I. Prime bidders, by submission of a comprehensive bid on the project are indicating that the subcontractors selected in their bid have complied with all Division 00 & 01 requirements, that they have indicated in writing, prior to bidding, all questions or concerns requiring clarification and/or explanation and have documented any and all specific exclusions involving work that would generally be considered to be work of their trade.
- J. The prime bidder shall coordinate all work so that anything excluded by the bidder of all or

any portions of this section or division, have been addressed prior to bids in one of the following manners:

1. The work has been confirmed, by the prime bidder, to be work of another trade or subcontractor (whose proposal is also being accepted).
2. Clarification of the matter has been made through the prime design professional via written addendum and is clearly and mutually understood by the prime bidder and the party raising the issue/question, or seeking clarification.
3. The work has been accepted as the responsibility of the prime contractor directly.

1.7 MATERIAL AND EQUIPMENT

- A. The term "provide" when used in the Contract Documents includes all items necessary for the proper execution and completion of the Work.
- B. Specific reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect expressed in writing is equal to that specified.
- C. Coordinate and properly relate all Work of this Division to building structure and work of all other trades.
- D. Visit premises and become thoroughly familiar with existing conditions; verify all dimensions in field. Advise Architect of any discrepancies prior to Bid Date in accordance with Division 00.
- E. Do not rough-in for any item or equipment furnished by others or noted "Not in Contract" (NIC), without first receiving rough-in information from physically examining the existing equipment, receiving specific cut sheet information from the Owner's representative, other trades and/or Architect. Rough-in services for "NIC" equipment as required, as the work progresses.
- F. Provide storage and protection for all equipment and materials in accordance with requirements of Division 00 & 01. Replace any equipment and materials damaged by improper handling, storage, or protection, at no additional cost to Owner.
- G. Keep premises clean in accordance with requirements of Division 00 & 01.

1.8 EXTRA MATERIALS

- A. Sprinkler heads and cabinets: Provide spare sprinkler heads of each style included in the project. Furnish each style with its own special wrenches and in quantities as specified by NFPA 13. Minimum of six (6) spare heads required.
- B. Identify the storage cabinet and each spare sprinkler head with labels describing contents.

1.9 SUBSTITUTIONS

- A. Substitutions are only allowed by approval of the Architect prior to Bid Date as stipulated in Division 00 & 01.
- B. Design of systems is based on specific equipment. If the use of other manufacturer's equipment, even though approved by Architect, involves additional cost due to space

requirements, foundation requirements, increased mechanical or electrical services, the cost of such extra work shall be borne by Contractor. Even though a manufacturer's name appears in the Contract Documents as having acceptable equipment, their equipment with different model numbers shall be classified as being a substitute to the equipment originally designed for and named in the Contract Documents. Substitute equipment, materials, etc., will not be allowed to deviate from Contract Document requirements. Furnish all options specified or reasonably implied from the contract documents. Specifically identify any variance in regard to submittal versus specified performance on the cover sheet of each submittal.

1.10 POST-BID VALUE ENGINEERING (V/E):

- A. While it may be in the project Owner's interest to consider the first cost money saving that may be generated via alternatives and options generated via participation in Value Engineering, Division 21 contractor shall realize that substantive offers of Value Engineering (V/E), if accepted by the Owner, constitute a design-build agreement (offer and acceptance) with the owner, and drastically change the design concept of the project, as developed by the Professional of Record identified on the Contract Documents.
- B. Should contractor offer, and the owner accept value engineering options that alter aspects of the system design, equipment, performance and/or performance verification or monitoring of respective systems, Division 21 contractor shall provide duly licensed professional engineering consultants working on behalf of the Division 21 contractor (including sub-contractors and equipment vendors/manufacturers) to review, approve and take professional responsibility for performance and suitability of V/E hybrid systems, materials or operational changes related to respective V/E items. The Division 21 contractor's licensed professional engineering consultants and the Division 21 contractor assume any and all responsibility for the design and suitability in terms of performance, of hybrid systems installed, as Division 21 contractor's Professional of Record, absolving the original project Professional of Record (identified on the original Contract Documents, released for the original project Bid/Negotiation) from responsibility for the V/E hybrid systems portion of the work.
- C. Division 21 contractor, via the offer and acceptance of value engineering items on the project agrees to provide professional engineering design services and take full and complete responsibility for the hybrid design.
- D. Further, the Division 21 contractor's (V/E Items) professional of record (either employees, or independent consultants to the Division 21 contractor) through the offer and acceptance of V/E items, agree to indemnify and hold harmless the project owner, the owner's original A/E team (Professional of Record on behalf of the owner for the original Contract Documents) their heirs and assigns in regard to the V/E changes and their impact on the Division 21 systems altered, affected or modified, in whole or in part.
- E. The Professional of Record shown on the original Contract Documents in regard to the systems altered, adjusted, revised, modified or otherwise affected by the value engineering items implemented, shall be absolved of design responsibility as a result of implementation of V/E items, and their original use of Engineering Seals used for original Contract Documents, shall not apply.

1.11 DRAWINGS AND SPECIFICATIONS

- A. The specific intent of these Contract Documents is to provide the various systems, equipment, etc. to the Owner complete and in a thoroughly calibrated functional condition.
- B. The Drawings shall not be construed as shop drawings. In the event of a possible interference with piping or equipment of another trade, items requiring set grade and

elevations shall have precedence over other items should any major interference develop, immediately notify the Architect.

- C. In laying out Work, refer to mechanical, electrical, structural, and architectural drawings at all times in order to avoid interference and undue delays in the progress of the Work.

1.12 CODES AND REGULATIONS

- A. Work shall be in full accord with the most stringent interpretation of the local AHJ, local ordinances, building codes, and other applicable national, local, and state regulations.
- B. Equipment shall conform to requirements and recommendations of the National bureau of Fire Underwriters and National Fire Protection Association (NFPA).
- C. Items provided under this Division shall comply with the American National Standards Institute (ANSI) "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People," ANSI A 117.1
- D. In the possible event of conflict between codes or regulations and Contract Documents, the most stringent interpretation of either shall govern (provided if exceeds the requirements of other codes). In the event of an irreconcilable difference between codes or regulations notify the Architect/Engineer immediately.
- E. In addition to the codes heretofore mentioned, all work and equipment shall conform to the applicable portions of the following promulgated specifications, codes and/or regulations:
 - 1. NFPA 13
 - 2. NFPA 101
 - 3. National Electrical Code (NEC)
 - 4. International Building Code (2021 IBC)
 - 5. Underwriters Laboratories (UL)
 - 6. LA State Fire Marshal Regulations
- F. All materials, equipment and accessories installed under this Contract shall conform to all rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. All materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.
- G. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.
- H. All unfired and fired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel. Contractor shall provide and pay for first operating certificate as per State Fire Marshal Regulations.

1.13 FEES, PERMITS, AND TAXES

- A. Obtain and pay for permits required for the Work of this Division. Pay fees in connection therewith, including necessary inspection fees.
- B. All permits, fees, certificates, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority

and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor.

- C. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.

1.14 REQUEST FOR APPEAL

- A. The Contractor shall be required to complete any appeal to the State of Louisiana Fire Marshal's Office required to address review comments associated with the fire protection system shop drawings. The Contractor shall be responsible for completing the appeal forms and submitting to the AHJ. The Contractor shall be responsible for the associated cost of the appeals associated with this project.

1.15 SUBMITTALS

- A. Product Data: Include each manufacturer's data sheet for each type sprinkler head, valve, pipe, piping specialty, fire protection specialty, specified.
- B. Plans and Diagrams: Working plans (drawings) shall be prepared by the contractor and found acceptable by all Authorities Having Jurisdiction before commencing fire protection installation.
- C. Contractor shall pay all applicable fees required, by all Authorities Having Jurisdiction, for the project thru completion of project.
- D. All drawings shall be made at minimum 1/8" scale and arranged same as contract drawings.
- E. Shop Drawings: Submit working drawings which have been prepared in accordance with the requirements contained herein and identified as "Working Drawings," including hydraulic calculations and manufacturers data sheets.
 - 1. Submit one (1) copy of the working drawings printed to scale, manufacturers' product data sheets, and hydraulic calculations to the Architect/Engineer for review.
 - 2. If the submittal is found acceptable the shop drawing review stamp will be applied to the shop drawing submittal. The submittal will then be scanned and a pdf copy will be transmitted to the contractor for electronic submittal to the State Fire Marshal's Office and all other Authorities Having Jurisdiction for review.
- F. Quality Control Submittals:
 - 1. Welders' qualification certificates.
 - 2. Test Reports and Certificates: Include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping" as described in NFPA 13.

1.16 QUALITY ASSURANCE

- A. Installer's Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified means experienced in such work (experienced shall mean having a minimum of five (5) previous projects similar in size and scope to this project), familiar with all precautions required, and has complied with all the requirements of the Authority Having Jurisdiction. Upon request, submit evidence of such qualifications to the Engineer. Refer to Division-01 Section: "Definitions and Standards" for definitions for "Installers."

1.17 QUALIFICATIONS OF CONTRACTOR:

- A. The contractor shall be a qualified fire protection contractor, licensed by the State of Louisiana and directly engaged in the installation of automatic fire sprinkler systems and other fire protection equipment.
- B. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9, Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR-3."
- C. Regulatory Requirements: Comply with the requirements of the following codes (Latest Edition):
 - 1. NFPA 13 - Standard for the Installation of Sprinkler Systems.
 - 2. UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

1.18 MANUFACTURER'S DIRECTIONS

- A. Install and operate equipment and material in strict accord with manufacturer's installation and operating instructions. The manufacturer's instructions shall become part of the Contract Documents and shall supplement Drawings and Specifications.

1.19 GROUNDS AND CHASES

- A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

1.20 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor, with the various trades being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimble without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

1.21 PROTECTION OF EQUIPMENT AND MATERIALS

- A. During the project the Contractor shall safe guard and take the necessary precautions to protect the equipment and materials from damage. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Professional of Record shall be a sufficient cause for rejection of the damaged piece of equipment, material and/or assembly. In this case the Contractor shall be responsible for replacing the damaged piece of equipment, material and/or assembly to the satisfaction of the Professional of Record.

1.22 CLEANING AND ADJUSTING:

- A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

1.23 LOCAL CONDITIONS

- A. The location and elevation of all utility services is based on available surveys and utility maps and are believed to be reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.
- B. In case major changes are required, this fact, together with the reasons therefore, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.24 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes, etc. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect for approval before proceeding. Extra charges shall not be allowed for these changes.
- B. Only typical details are shown on the Plans. In cases where the Contractor is not certain about the installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.
- C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.
- D. Contractor shall make note that the sprinkler head locations and piping layout are diagrammatic and the spaces shall have proper number of heads and proper pipe size in the contractor's bid.

1.25 PROJECT RECORD DOCUMENTS

- A. Keep Project Record Documents in accordance with requirements of Division 00 & 01.
- B. During construction period, keep accurate records of installations made under this Division, paying particular attention to major interior and exterior underground and concealed piping, ductwork, etc.
- C. The Contractor shall obtain at his cost, two sets of prints of the original bid documents by the Architect. One print set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other print set will be utilized to record all field changes to a permanent record copy for the Owner.
- D. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, all such variances on the print set in red. The original print set shall be returned to the Architect for documentation.
- E. Provide electronic (PDF) copies of all documentation included in Final Report.
- F. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.

- G. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.
- H. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
- I. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases, this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.
- J. The following requirements apply to all "As-Built" drawings:
 - 1. They shall be maintained at the Contractor's expense.
 - 2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
 - 3. Additional drawings shall be provided as necessary for clarifications.
 - 4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
 - 5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

1.26 USE OF ELECTRONIC (CAD) MEDIA

- A. Electronic media (cadfiles) can be made available to the Contractor by filling in the information on the next page, agreeing to the single use waiver and submitting to the Architect/Engineer.

**AGREEMENT FOR SINGLE USE OF ELECTRONIC (CAD) MEDIA
ASSOCIATED DESIGN GROUP, INC.**

NAME OF PROJECT: _____

ADG PROJECT NO.: _____

At your request to facilitate the preparation of shop drawings or submittals, we will provide electronic files for your singular, limited use specifically on the project in question, subject to the following terms and conditions:

The electronic files are compatible with AUTOCAD 2010. We make no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications. CAD files remain the property of the Engineer of Record and in no case shall the transfer of these files be considered a sale.

Data contained on these electronic files is part of the design professionals instrument of service and shall not be used by you or anyone else receiving this data through or from you for any purpose other than as source of information for the referenced project and shall not be relied upon as an authoritative source of data for design or layout. Any use by your organization or by others will be at your sole risk and without liability or legal exposure to ADG, Inc. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against ADG, Inc. its officers, directors, employees, agents or subconsultants which may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold harmless ADG, Inc. from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from your use of these electronic files.

AUTHORIZED ACCEPTANCE:

COMPANY NAME OF CONTRACTOR

CONTRACTOR AUTHORIZED CONTACT NAME (PRINTED) / TITLE

AUTHORIZED SIGNATURE

DATE

LIST SPECIFIC DRAWINGS (SHEET #) & SHEET TITLES REQUESTED IN BOX BELOW:

- B. Provide the Owner with three (3) copies of printed instructions indicating various pieces of

equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.

1.28 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.
- B. If the Contractor's office is in excess of a fifty (50) mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The name of the contractor appointed to provide emergency services shall be submitted to the Architect for his approval.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 21 00 00



SECTION 21 11 00 - SPRINKLER PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pipe, fittings, valves, covers, and connections for combination sprinkler and standpipe systems including exterior piping systems.

1.2 RELATED SECTIONS

- A. Division 21, Section 21 00 00- "Fire Protection General Provisions"
- B. Division 21, Section 21 13 19 - "Sprinkler Systems"
- C. Division 21, Section 21 12 00 - "Standpipes and Fire Hoses"

1.3 REFERENCES

- A. ASME Boiler and Pressure Vessel Code Section IX - Welding and Brazing Qualifications.
- B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 250.
- C. ASME B16.3 - Malleable Iron Threaded Fittings, Class 300.
- D. ASME B16.4 - Cast Iron Threaded Fittings, Class 250.
- E. ASME B16.5 - Pipe Flanges and Flanged Fittings.
- F. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings.
- G. ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.
- H. ASME B16.25 - Buttwelding Ends.
- I. ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- J. ASTM A135 - Electric-Resistance-Welded Steel Pipe.
- K. ASTM A47 - Malleable Iron Castings.
- L. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- M. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- N. AWWA C110 - Ductile Iron and Gray Iron Fittings.
- O. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.
- P. NFPA 13 - Installation of Sprinkler Systems.
- Q. NFPA 14 - Standpipe and Hose Systems.
- R. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

- S. UL - Fire Resistance Directory.
- T. UL 262 - Gate Valves for Fire-Protection Service.
- U. UL 312 - Check Valves for Fire-Protection Service.
- V. UL 405 - Fire Department Connections.

1.4 SUBMITTALS FOR REVIEW

- A. Section - "Submittal Procedures": Procedures for submittals.
- B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
 - 1. Grooved joint couplings and fittings shall be referred to on drawings and product submittals, and be identified by the manufacturer's listed model or series designation.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
 - 1. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification number or Series designation as specifically published in the appropriate agency listing or approval.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Section - "Closeout Submittals": Record actual locations of components and tag numbering.
- B. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
 - 1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - 2. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.
- B. Installer Qualifications: Company specializing in performing the work of this section and shall be licensed to perform sprinkler work in the State of Louisiana.

1.7 REGULATORY REQUIREMENTS

- A. Conform as a minimum to UL and FM.
- B. Sprinkler Systems: As a minimum, conform work to NFPA 13.
- C. Standpipe and Hose Systems: As a minimum, conform to NFPA 14.

- D. Welding Materials and Procedures: Conform to ASME Code and AWS D10.9.
- E. Valves: Bear UL and/or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND PROTECTION

- A. Refer to Architectural Specification Section - "Temporary Facilities & Controls": Transport, handle, store, and protect products.
- B. Deliver and store valves in shipping containers, with labeling in place.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Store all materials a minimum of 12" above grade when stored in exterior environment, 6" when stored on slab. Do not allow materials to contact ground. Provide end caps on all piping to prevent dirt or other construction debris from entering piping while stored.

1.9 EXTRA MATERIALS

- A. Provide two sets of valve stem packings for each size and type of valve installed.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTOR ASSEMBLY

- A. Backflow Preventors:
 - 1. Provide Reduced Pressure Principal or Double Check Assembly as required by local governing authority and at a location approved by the Authority Having Jurisdiction.
 - 2. Enclose backflow assembly in a heated enclosure.
- B. Heated Valve Assembly Enclosure
 - 1. Provide factory assembled, heated, backflow preventor assembly enclosure. Enclosure shall be constructed and approved to ASSE Standard 1060 as a "Class I Freeze Protection Enclosure".
 - a. Acceptable Manufacturers
 - i. Hot Box
 - ii. Safe - T - Cover
 - 2. Provide insulated valve enclosure on all above ground exposed fire protection piping. Insulate fire protection piping which is NOT located in heated valve box assembly.
 - 3. Insulation shall be polyisocyanurate foam sprayed in place with a minimum of 1-inch thickness average coverage.
 - a. Dimensional stability shall be less than 2% linear shrinkage.
 - b. Compressive strength shall be 20 psi or greater.
 - c. Flame spread rating shall not exceed 25.
 - 4. Enclosure shall be of aluminum.
 - 5. Structural components shall be of aluminum.

6. Multi-sectional enclosures shall be fitted together with overlapping "tongue & groove" joints.
7. The enclosure shall be securely attached to a concrete base with anchor brackets installed on the interior of the enclosure, through the flange base of the enclosure itself or through a stainless steel anchor hinge.
8. Access panels shall be provided to allow access for operations and inspections without the removal of the entire enclosure.
9. Heating equipment shall be furnished by the enclosure manufacturer to maintain a temperature of 40 deg F with an outside temperature of (-) 10 deg. F.
 - a. Factory assemble heater shall be ETL, UL, or CSA certified.
 - b. Heating equipment shall be installed above the level of the backflow equipment.
 - c. Electrical power source shall be GFI protected, with a minimum of 18" clearance from the receptacle base to the top of slab.
10. Enclosure shall have the following text/lettering posted on all four exterior walls of the enclosure.
 - a. "FIRE DEPARTMENT USE, SPRINKLER CONTROL VAVLES"
 - b. Lettering shall be RED in color and shall be no smaller than three (3) inches in height.

2.2 BURIED PIPING

- A. Ductile Iron Pipe: AWWA C151.
 1. Fittings: AWWA C110, standard thickness.
 2. Joints: AWWA C111, rubber gasket.
 3. Mechanical Couplings: Shaped composition sealing gasket, stainless steel bolts, nuts, and washers.
 4. Listed and internally lined with cement or epoxy coated.
- B. PVC Pipe (On exterior of building) - ASTM - D2241; AWWA - C-900, Class 150-DR-18.
 1. Fittings - AWWA C110.
 2. Joints - ASTM F-477; AWWA C-111.
 3. Mechanical Couplings - Shaped composition sealing gasket, stainless steel bolts, nuts and washers.
- C. Refer to Architectural Specification - "Excavation, Filling and Grading" for further specific trenching and backfilling requirements.

2.3 ABOVE GROUND PIPING

- A. General: Refer to PART 3 - Article 3.2 "PIPE APPLICATIONS" or on individual plan sheets for identification and type of piping where the below materials are used.
 1. All above ground fire protection piping located within non-heated enclosures shall be insulated.
- B. Steel Pipe (Galvanized steel pipe manufactured in Korea shall not be accepted): ASTM A53; ASTM A135; ASTM A795; Schedule 10 and 40, black and galvanized.
 1. Steel Fittings: ASME B16.9, wrought steel, buttwelded; ASME B16.25, buttweld ends; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
 2. Ductile Iron Fittings: ASME B16.1, flanges and flanged fittings; ASME B16.4, threaded fittings; or ASTM A536 Grade 65-45-12 grooved end fittings.

- a. Grooved - In applicable sizes, fittings shall be short-pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
- 3. Malleable Iron Fittings: ASME B16.3, threaded fittings
- 4. Mechanical Roll Grooved Couplings (Cut grooves not acceptable): Two (2) ductile iron housing clamps to engage and lock, "C" shaped or center-leg elastomeric sealing gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth, ASTM A449 compliant steel bolts, nuts, and washers; galvanized for galvanized pipe. Anvil and Victaulic:
 - a. Ridgid: Victaulic Style 009-EZ and 107N
 - b. Flexible: Victaulic Style 177 Installation Ready and Style 77
 - c. Listed for dry or wet pipe use.
 - d. Grooves shall be rolled (cut grooves not allowed).
 - e. Couplings shall be Installation-Ready in applicable sizes, for direct stab installation without field disassembly.
- 5. Installation-Ready™ fittings for Schedule 40 grooved end steel piping in fire protection applications sizes NPS 1-¼ thru 2½ (DN 32 thru DN 65). Fittings shall consist of a ductile iron housing with Installation-Ready™ ends, prelubricated Grade "E" EPDM Type 'A' gasket, and ASTM A449 electroplated steel bolts and nuts. UL listed for a working pressure of 300 psi (2065 kPa) and FM approved for working pressure 365 psi (2517kPa).
- 6. In lieu of threaded steel piping systems, the Victaulic FireLock IGS System with "Installation-Ready™ fittings and couplings may be used for NPS 1 (DN 25) Schedule 40 carbon steel pipe in fire protection applications. System rated for a working pressure to 365 psi (2517 kPa).
 - a. Groove: IGS "Innovative Groove System" groove with shortened "A" dimension and tapered groove backside for ease of installation.
 - b. Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.
 - c. Fittings: Ductile iron housing conforming to ASTM A-536, Grade 65-45-12. Orange enamel coated or galvanized.
 - d. Victaulic Style 101 (90-degree elbow), Style 102 (tee), and Style 108 (coupling) with Installation-Ready™ ends.
 - e. Style 108 single-bolt coupling provided with EPDM Type A pressure responsive gasket with Vic-Plus lubricant, and ASTM A449 compliant electroplated steel bolt and nut. CrMo alloy steel coupling linkage.

2.4 PIPE HANGERS AND SUPPORTS

- A. Conform to the General Requirements of NFPA 13 and NFPA 14 and the additional design and installation requirements as listed below:
 - 1. Provide hangers and vertical piping restraints within 12 inches on all sprinkler drops at end of branch where system pressure exceeds 100 psig in accordance with NFPA 13.
 - 2. Provide hangers within 12 inches of each turn of direction (horizontal elbow) in sprinkler piping.
 - 3. Powder- driven Studs are not acceptable.
 - 4. Prime coat all sprinkler pipe hangers where indicated in Part 3 - "Execution"
 - 5. Hangers for Pipe Sizes 1 through 6 Inch: Provide Carbon steel, adjustable swivel, split ring hangers.
 - 6. Multiple or Trapeze Hangers: Steel pipe or steel angles with welded spacers and hanger rods.
 - 7. Vertical Support: Steel riser clamps.
 - 8. Floor Support: Cast iron adjustable pipe saddles, lock nut, nipple, floor flange, and concrete pier or steel support.

2.5 FIRE PROTECTION GATE VALVES

A. Up to and including 2 Inches:

1. Manufacturers:
 - a. Nibco Model T-104-O.
 - b. Kennedy Model KS-FW
2. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 Inches:

1. Manufacturers:
 - a. Nibco Model F-697-0., F-609
 - b. Kennedy Model KS-FW
 - c. Victaulic Series 771
2. Iron body, bronze trim, rising stem, pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged, or grooved ends. 250 psi pressure rated

2.6 BALL VALVES

A. Up to and including 2 Inches (Ball valves are not to be used over 2 inches):

1. Manufacturers:
 - a. NIBCO KG-505-W-8
 - b. Victaulic Series 728
2. Brass two piece body, chrome-plated brass, full port, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, weatherproof actuator housing with supervisory switches and handwheel or lever handle and balancing stops, threaded or grooved ends. 300 psi pressure rated.

2.7 AUTOMATIC AIR VENT VALVES

A. Automatic Air Vent:

1. Manufacturers:
 - a. Potter Model "PAV" with ball valve and Potter Model RBVS tamper witch
2. Manufacturers:
 - a. Engineered Corrosion Solutions Model "PAV-W" Automatic Air Vent with ball valve and Potter Model RBVS tamper switch

2.8 BUTTERFLY VALVES

A. Cast or Ductile Iron Body:

1. Manufacturers:
 - a. Kennedy Fig. G300 or 01G
 - b. Victaulic Series 705
2. Cast or ductile iron, chrome or electroless-nickel plated ductile iron or aluminum bronze disc, pressure responsive resilient replaceable EPDM seat, stainless steel stem (offset from the disc centerline to provide complete 360-degree circumferential seating), wafer, lug, or grooved ends, extended neck, with weatherproof actuator housing and handwheel with gear drive and integral indicating device, and internal tamper switches rated 10 amp at 125 volt AC. 300 psi pressure rated.

2.9 CHECK VALVES

A. Up to and including 2 Inches:

1. Manufacturers:
 - a. Nibco Model KT403W
 - b. Victaulic Series 717
2. Bronze body and swing disc, rubber seat, threaded ends.
3. Ductile iron body with stainless steel spring for vertical or horizontal installation, grooved ends. 250 psi rated.

B. Over 2 Inches:

1. Manufacturers:
 - a. Nibco Model G917-W
 - b. Victaulic Series 717
2. Ductile iron body, bronze trim, spring-assisted swing check for vertical or horizontal installation with stainless steel or rubber / elastomer encapsulated disc, renewable disc and seat, grooved or flanged ends with automatic ball check. 250 psi pressure rated.

2.10 BACKFLOW PREVENTER VALVE ASSEMBLY

A. Manufacturer

1. Wilkins
 - a. Model 350 ASTDA with by-pass meter, bypass double check valve assembly OS&Y Valves and tamper switches (Butterfly valves with integral tamper switches)
 - b. **LAWCO** Model 375 ASTDA with by-pass meter, Reduced Pressure Detector Assembly OS&Y Valves and tamper switches (Butterfly valves with integral tamper switches)
2. Apollo Valves
 - a. Model DCDALF 4A with by-pass meter, bypass double check valve assembly, OS&Y Valves and tamper switches (Butterfly valves with integral tamper switches)
 - b. **LAWCO** Model RPDALF4A with by-pass meter, Reduced Pressure Detector Assembly, OS&Y Valves and tamper switches (Butterfly valves with integral tamper switches)
3. Watts/Ames
 - a. **LAWCO** Model Derringer 50 with by-pass meter, Reduced Pressure Detector Assembly OS&Y Valves and tamper switches

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends.

1. Remove burrs.
2. Bevel or groove plain end ferrous pipe.
3. Remove scale and foreign material, from inside and outside, before assembly.
4. Prepare piping connections to equipment with flanges or unions.

5. Unions and flanges for servicing or disconnect are not required in installations using grooved mechanical joint couplings.

3.2 PIPE APPLICATIONS

- A. Underground Pipe: Listed, lined, ductile iron pipe and fittings, 250 lb working pressure. Refer to Architectural Specification - "Excavation, Filling and Grading" for further specific trenching and backfilling requirements.
 1. Depth of Bury:
 - a. Minimum 36 inches depth of bury from top of pipe to finished grade in accordance with NFPA 24.
 - i. Provide pipe tape markers and # 12 copper trace wire over entire length of pipe.
 - b. Minimum 42 inches depth of bury under driveways, slabs, parking lots, etc., in accordance with NFPA 24.
 - i. Provide pipe tape markers and # 12 copper trace wire over entire length of pipe.
- B. Underground Pipe: Listed C900 DR 18 PVC pipe and ductile iron fittings, 150 lb working pressure. Refer to Architectural Specification - "Excavation, Filling and Grading" for further specific trenching and backfilling requirements.
 1. Depth of Bury:
 - a. Minimum 36 inches depth of bury from top of pipe to finished grade in accordance with NFPA 24.
 - i. Provide pipe tape markers and # 12 copper trace wire over entire length of pipe.
 - b. Minimum 42 inches depth of bury under driveways, slabs, parking lots, etc., in accordance with NFPA 24.
 - i. Provide pipe tape markers and # 12 copper trace wire over entire length of pipe.
- C. Above Ground Pipe: Provide piping in accordance with the following schedule of systems:
 1. Sprinkler pipe (wet pipe - 1 1/4 inches & below): Schedule 40 steel pipe - screwed fittings or with rolled grooves and roll grooved fittings where the fittings are designed to prevent the pipe from rotating.
 2. Sprinkler pipe (wet pipe - 1 1/2 thru 5 inches): Schedule 40 steel pipe with rolled grooves and roll grooved fittings.
 3. Sprinkler pipe (wet pipe - 6 inches and larger): Schedule 10 steel pipe with rolled grooves and roll grooved fittings.
 4. Sprinkler risers in stairwells (wet pipe - 4 inch & below): Schedule 40 steel pipe - rolled grooved fittings.
 5. Sprinkler risers in stairwells (wet pipe - 6 inch & above): Schedule 10 steel pipe - rolled grooved fittings.
 6. Standpipe hose system (wet or dry pipe system): Schedule 40 steel pipe - screwed fittings.
 7. Drain lines: Schedule 40 galvanized steel pipe - screwed or grooved fittings.

*All exposed sprinkler pipe where indicated to be painted shall be properly prepared for painting

3.3 INSTALLATION

- A. Heated Backflow Prevention Device enclosure shall be assembled and mounted on concrete pad in accordance with the manufacturer's published installation instructions.
 - 1. Enclosure shall be installed plumb, level, and square.
- B. Install piping in accordance with NFPA 13 for Sprinkler Systems, NFPA 14 for Standpipe and Hose systems, and NFPA 24 for service mains. Refer to Architectural Specification "Excavation, Filling and Grading" for further specific trenching and backfilling requirements.
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipes passing through partitions, walls, and floors.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Pipe Hangers and Supports:
 - 1. Install in accordance with NFPA 13 and NFPA 14 except where specifically indicated in order to raise the minimum standards set by NFPA.
 - 2. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
 - 3. Place hangers within 12 inches of each horizontal elbow.
 - 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 7. Prime coat exposed steel hangers and supports or provide factory primed hangers and supports. Refer to Section - "Painting". Hangers and supports located in areas not generally in view of the general public including crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.
- I. Electrical Service to Fire Protection Systems:
 - 1. Except for high voltage electrical service to fire pumps, jockey pumps, and pump controllers, if electrical circuits or services are required for the operation of the fire protection system(s) at a location selected by sprinkler designer, the sprinkler contractor shall coordinate the location and placement of required electrical circuit(s) with the electrical sub-contractor. It is the responsibility of the sprinkler contractor to coordinate the number, size, type, and location of electrical circuits in the field with other trades. The fire protection contractor shall be responsible for providing and/or paying for all costs associated with providing electrical service for his equipment prior to bidding.

- J. Drains:
1. Where sanitary sewer drains, storm drains, hub drains, floor drains, etc., are required for the draining of fire protection systems at a location indicated or selected by the sprinkler designer, the sprinkler contractor shall coordinate the location and placement of required drains with the plumbing sub-contractor. It is the responsibility of the sprinkler contractor to coordinate the number, type, and location of drains in field with other trades. Contractor shall be responsible for covering all costs associated with providing for and/or paying for drainage piping for his equipment prior to bidding.
- K. Slope piping and arrange systems to drain at low points.
1. Use eccentric reducers to maintain top of pipe level.
- L. Do not penetrate building structural members unless indicated.
- M. Provide sleeves when penetrating building footings, floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance rating equivalent to fire separation required.
- N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- O. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- P. Grooved Joints: Install in accordance with the manufacturers latest published installation instructions. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to (and including) the groove. Gasket shall be verified as suitable for the intended service. Contractor shall remove and replace any improperly installed products. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.
- Q. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.
1. Provide gate or butterfly valves for shut-off or isolating service.
 2. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.4 TRAINING & DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 2. Familiarization with contents of Operating and Maintenance Manuals specified in Architectural Specification - "Closeout Submittals" and Division 15, Section - "Basic Mechanical Materials & Methods."
 3. Provide Service Manuals for each sprinkler system specified.

B. Provide three (3) hours of factory authorized training and demonstration.

1. Refer to Section - "Mechanical General Provisions" for video taping requirements.
2. Schedule training with a minimum of seven (7) days notice to Owner's Representative.

END OF SECTION 21 11 00

**PRELIMINARY
NOT FOR
CONSTRUCTION**

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SECTION 21 12 00 - STANDPIPES AND FIRE HOSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Standpipe system.
- B. Fire department connection.

1.2 RELATED SECTIONS

- A. Division 21, Section 21 11 00 - "Fire Protection Piping"
- B. Division 21, Section 21 13 19 - "Sprinkler Systems"

1.3 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- B. NFPA 14 - Standard for the installation of Standpipe and Hose Systems; National Fire Protection Association; 2016 ed.
- C. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories, Inc.; current edition.

1.4 SUBMITTALS

- A. See Division 1, Specification Section - "Submittal Procedures" for submittal procedures.
 - 1. Product Data: Provide manufacturer's catalog sheet for equipment indicating rough-in size, finish, and accessories.
 - 1. Grooved joint couplings and fittings shall be referred to on drawings and product submittals, and be identified by the manufacturer's listed model or series designation.
 - 2. Shop Drawings: Indicate supports, components, accessories, and sizes.
 - 3. Submit shop drawings and product data thru Architect to State Fire Marshal's Office.
 - 4. Project Record Documents: Record actual locations of components.
 - 5. Operation Data: Include manufacturer's data.
 - 6. Maintenance Data: Include servicing requirements and test schedule.
 - 7. Certificates: Provide certificate of compliance from authority having jurisdiction indicating approval of field acceptance tests.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 14. Maintain one copy on site.
- B. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 - 1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

1.6 PRE-INSTALLATION MEETING

- A. Convene one (1) week before starting work of this section.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Delivery and store products in shipping packaging until installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
 - 1. Tyco
 - 2. Potter Roemer
 - 3. Viking
 - 4. Victaulic
- B. Grooved Joint Fittings: ASTM A536, Grade 65-45-12, ductile iron; wrought steel ASTM A234; or factory manufactured from ASTM A53 steel pipe. Basis of Design: Victaulic Company.
 - 1. In applicable sizes, fittings shall be short-pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic FireLock.
- C. Mechanical Roll Grooved Couplings (Cut grooves not acceptable): Two (2) ductile iron housing clamps to engage and lock, "C" shaped or center-leg elastomeric sealing gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth, ASTM A449 compliant steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 1. Ridgid: Victaulic Style 009-EZ and 107N
 - 2. Flexible: Victaulic Style 177 Installation Ready and Style 77.
 - 3. Couplings shall be Installation-Ready in applicable sizes, for direct stab installation without field disassembly
- D. For use with AWWA ductile iron pipe sizes, Victaulic Style 31 coupling may be used. Where pipe transitions from ductile iron to IPS steel, Victaulic Style 307.

2.2 VALVES

- A. Hose Connection Valve: Angle type; brass finish; 2 ½ inch size, thread to match fire department hardware, 300 psi working pressure, with threaded cap and chain of same material and finish;
- B. Hose Connection Valve:
 - 1. 1 ½" Angle type
 - 2. Brass finish
 - 3. Thread to match local Fire Department Standards
 - 4. 300 psi working pressure
 - 5. Escutcheon where required
 - 6. Satin brass hose rack nipple
 - 7. Satin brass pin lug coupling

8. 100 lf, lined, FM approved, 300 psi test pressure, polyflex hose
9. Red nylon all fog nozzle
10. UL/FM red glossy polyester coated steel hose rack

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 14.
- C. All vertical and/or horizontal runs of standpipe piping shall comply with NFPA 14: 6.1.2.2.1.3 and IBC 905.4.2 when applicable.
- D. Connect standpipe system to water source ahead of domestic water connection.
- E. Flush entire system of foreign matter.
- F. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

3.2 ELECTRICAL SERVICE TO FIRE PROTECTION SYSTEMS

- A. Except for electrical service to fire pumps, if electrical circuits or services are required for the operation of the fire protection system(s) at a location selected by sprinkler designer, the sprinkler contractor shall coordinate the location and placement of required electrical circuit(s) with the electrical sub-contractor. It is the responsibility of the sprinkler contractor to coordinate the number, size, type, and location of electrical circuits in the field with other trades. The fire protection contractor shall be responsible for providing and/or paying for all costs associated with providing electrical service for his equipment (except for fire pump service) prior to bidding.

3.3 DRAINS FOR FIRE PROTECTION SYSTEMS

- A. If drains are required for draining of systems at location(s) selected and/or installed by the sprinkler designer, the sprinkler contractor shall coordinate the location and placement of required drains with the plumbing sub-contractor. It is the responsibility of the sprinkler contractor to coordinate the number, type, and location of drains in field with other trades. Contractor shall be responsible for covering all costs associated with providing for and/or paying for drainage piping for his equipment prior to bidding.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01400.
- B. Test entire system in accordance with NFPA 14.

- C. Test shall be witnessed by Fire Marshal.

3.5 TRAINING & DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 - 1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 - 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 1, Section - "Closeout Submittals" and Division 15, Section - "Basic Mechanical Requirements."
 - 3. Provide Service Manuals for each stand pipe system specified.
- B. Provide four (4) hours of factory authorized training.
 - 1. Provide a minimum of seven (7) days advanced notice of training to Owner's Representative.
 - 2. Refer to Section - "Mechanical General Provisions" for video taping requirements.

END OF SECTION 21 12 00

SECTION 21 13 19 - SPRINKLER SYSTEMS



PART 1 - GENERAL

1.1 REQUIRED PRE-BID FLOW TESTS

- A. Prior to submitting a bid, the Sprinkler Contractor shall perform a flow test utilizing the nearest municipal fire hydrant(s) at the Project site in order to substantiate the basis of the Contractor's design. The flow test shall be performed using gauges which have been calibrated within twelve (12) months of the flow test. The flow test shall be performed in accordance with the recommendations included in NFPA 291.
 - 1. The Contractor shall utilize a five (5) psig reduction/safety factor in the field flow test data (static & residual) and a ten (10) percent reduction/safety factor in the flow in GPM obtained during the flow test for the basis of design in order to calculate and/or perform a hydraulic analysis of the proposed system.
- B. All flow test data shall be performed by the Contractor at no cost to Owner.
 - 1. Contractor shall notify the Owner's Representative a minimum of seven (7) days prior to flow tests being performed.
 - 2. Owner's Representative shall witness all flow tests.
 - 3. Provide a report to Owner's Representative stating location, time and duration of test.

1.2 SECTION INCLUDES

- A. Wet-pipe and dry-pipe sprinkler systems. Note!: Unless specifically so noted on plan sheets, the utilization of glycol anti-freeze wet-pipe sprinkler systems for freeze protection is not allowed!
- B. Sprinkler system design, installation, and certification including site work and insurances.
- C. Fire department connections.

1.3 RELATED SECTIONS

- A. Division 21, Section 21 00 00 - "Fire Protection General Provisions"
- B. Division 21, Section 21 11 00 - "Sprinkler Piping"
- C. Division 21, Section 21 12 00 - "Standpipes and Fire Hoses"

1.4 REFERENCES

- A. NFPA 13 - Installation of Sprinkler Systems.
- B. NFPA 14 - Installation of Standpipe and Hose Systems.
- C. FM - Factory Mutual Approval Guide.
- D. NFPA 70 - National Electrical Code.
- E. UL - Fire Resistance Directory.
- F. UL 199 - Automatic Sprinklers.

- G. Warnock Hersey - Certification Listings.

1.5 SYSTEM DESCRIPTION

- A. The sprinkler system is to provide coverage for the entire building.
 - 1. Note: It is not the intent of this specification to design or to construct the sprinkler system in accordance with the “minimum” design criteria allowed by the applicable codes. Where indicated, certain areas, specific equipment or methods may exceed the “minimum” criteria required by applicable codes. Refer to Section - “Mechanical General Provisions”, Article 1.3 - “Compliance with National & Local Code Requirements.”
 - 2. The contractor shall refer to both plans and specifications in order to accomplish the design intent.
- B. Provide a system designed in accordance with NFPA 13 for Light hazard, Ordinary hazard, Group 1, Ordinary hazard, Group 2, or other hazard classification as indicated on the various plan sheet.
- C. Interface the sprinkler system with the building Fire and Smoke Alarm Systems and Smoke Evacuation systems. Coordinate electrical power requirements or control interfaces with the various sub-contractors.
- D. Provide fire department connections where indicated. Coordinate thread patterns with the local fire department serving the site.

1.6 ELECTRICAL REQUIREMENTS

- A. Note: It is the intent of this section that prior to bidding, the fire protection contractor shall coordinate and either provide, or pay to provide, all of the minor electrical power and control services, circuits, wiring and conduit required for the fire protection equipment.
- B. It is not the intent of this section that the fire protection contractor provide or pay for the necessary electrical service to the emergency fire pump, jockey pump, controllers or associated wiring and conduit required to connect fire protection devices (such as limit switches, flow switches, tamper switches, etc.) to the fire alarm system. Other coordination issues and requirements between sub-contractors however, remain.

1.7 PLUMBING REQUIREMENTS

- A. Sprinkler Drains: “Note” - Where sewer or storm drains are required for any component of the sprinkler system such as pre-action cabinets, standpipes, risers, etc., the sprinkler contractor shall provide such drains as required to prevent spillage of water onto or within the building. Contractor shall coordinate with other trades and pay for and/or provide at the point of discharge, all floor drains, hub drains, catch basins, etc., needed for the maintenance and draining of the sprinkler system.

1.8 SUBMITTALS FOR REVIEW

- A. Refer to Architectural Specification - “Submittal Procedures”: for full submittal requirements.
- B. Product Data: Provide data on all system components including fire pumps (if applicable), pipes, sprinklers, valves, flow switches, pressure reducing devices, meters, and other specialties, including manufacturers catalog information. Submit performance

ratings, rough-in details, weights, support requirements, and piping connections. Contractor shall submit a minimum of one (1) printed set of shop drawings, hydraulic calculations, and equipment cut sheets to the Architect/Engineer for review. Architect/Engineer will review the submittal, and if it is found to be acceptable for submittal to the State Fire Marshals office for review, the Architect/Engineer will stamp it with their shop drawing review stamp. This stamped submittal will be scanned and a "PDF" copy will be E-mailed to the contractor for electronic submittal to the State Fire Marshall for review. Contractor shall be responsible for all fees and costs as may be required for final acceptance of system(s) by all Authorities Having Jurisdiction.

1. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification number or Model/Series designations as specifically published in the appropriate agency listing or approval.

C. Shop Drawings: Submittal to the State Fire Marshal shall occur after Contractor has obtained a "No Exception Taken", or "Appears to Comply" comment on the System Shop Drawings from the Architect/Engineer. No payment will be made to the contractor for any automatic sprinkler system work until submittal is forwarded to the AHJ for approval.

1. Provide project name, project address, occupancy and owner on application. Drawings shall include "Preparer of Shop Drawings" indicated on each sheet.
2. Drawing shall be legible and drawn to a scale suitable for proper definition and clarity. In no case shall the scale be less than $1/8" = 1' - 0"$. Indicate partitions or small enclosures in which no sprinklers are to be installed. Provide graphic representation of the scale used on all plans.
3. Submittal shall include a master list of all materials and equipment which is to be utilized for the project. Include manufacturers model number, size, color, and quantity of each.
4. Provide the number of sprinklers on each riser per floor.
5. Provide the total number of sprinklers on each dry pipe system, pre-action system, combined dry pipe pre-action system, or deluge system.
6. Provide the approximate capacity in gallons of each dry pipe system.
7. Provide the location and electrical characteristics of all air compressors, pre-action cabinets, and any and all other components which require electrical services.
8. Provide type of fittings and joints and location of all welds and bends. The contractor shall specify on the drawing any sections to be shop welded and the type of fittings or formations to be used.
9. Indicate piping provisions for flushing.
10. Provide kind, type and location of alarm bells.
11. Provide size, location, of hose outlets, hand hose, and related equipment if used. The hydraulic reference point shown on plans shall correspond with comparable reference points on the hydraulic calculation sheets.
12. Provide full height cross section of building or schematic diagram.
13. Provide the occupancy class or each area or room identified.
14. All sprinklers shall be identified by make, type, orifice size, temperature rating, thermal sensitivity including if applicable, all existing heads affecting the submitted scope of work.
15. For large storage areas, provide the storage height, method of storage, description of commodities, etc. If the project is a specialized storage design, provide a complete design statement denoting the methodology for arriving at the project area/densities.
16. All piping shall be identified by size, type, inside diameter, and schedule.
17. Submit layout of finished ceiling areas indicating sprinkler head locations and

type, fully coordinated with ceiling installation. Provide ceiling information such as heights, architectural profiles, (vaults, coffers, furrings, etc.), construction assembly, (combustible ceiling or framing, significant combustibles in ceiling cavity, etc.).

18. Provide sprinkler obstructions denoted (suspended light fixtures, duct work, fire alarm strobes, fire alarm horns, speakers, motion detectors, or other architectural items.)
19. Show all HVAC openings and all ductwork over 48" in width/height.
20. Indicate the method of maintaining the sprinkler system at or above 40 deg F. Describe all unheated applicable areas and explain the methodology of all sizes, types, locations, etc. of freeze protection devices.
21. Graphically highlight each hydraulic area (perimeter dashed lines, etc.) title each area on the plans with matching title on each calculation sheet.
22. Provide the locations and ratings of fire walls, unprotected vertical openings, and other assemblies affecting sprinkler design.
23. Provide a site plan showing location and size of city mains at street, denoting dead end or circulating or denote private supply system.
24. Provide the total area protected by each system on each floor.
25. Provide and indicate the location, type, and listing of each pipe hanger.
26. Provide the underground pipe size, length, location, type, point of connection to city main, bury depth, thrust blocks, and all appurtenances (valve types, water meters, backflow preventors, valve pits, etc.) with appropriate back-up data sheets denoting manufacturer's fire protection equipment listing and friction/pressure loss for each device.
27. Provide all hydraulic nameplate information.
28. Hydraulic reference points shall coordinate between the drawings and calculations.
29. Provide the setting for pressure reducing devices denoted.
30. Submit hydraulic calculations, building sections, site plan indicating piping layout, detailed building piping layouts, hangers and supports locations, sprinklers, components and accessories. Indicate system controls.

D. Hydraulic Calculations:

1. Verify that the water supply, test location, date (must be 4 months current) of peak demand time (or calculated adjustment) and account for test elevations at calculations. Reduce the static and residual pressures by 5 psig and calculate on this basis.
2. Verify the hazard classification (light, ordinary, special occupancy, etc.).
3. Verify the design criteria (density/sq. ft. over the hydraulic design area).
4. Verify the location of the design area calculated (most hydraulically demanding not always the most physically remote).
5. Verify the physical dimensions of the area calculated (design area shall not extend beyond the designated area served by each sprinkler). Sufficient length parallel to the branch lines or cross mains, as required.
6. Verify the densities (sprinklers flowing at or above minimum required flow rate).
7. Verify the pipe sizes, lengths, equivalent lengths of fittings, and flow paths (account for all pressure losses).
8. Verify the hose demand and provide the total quantity of water and the pressure required for hose streams both inside and outside.
9. Confirm that the system demand is at or less than the available water supply (include demand versus supply graph).
10. Sprinkler Drains: "Note" - Where drains are required for any component of the sprinkler system such as pre-action cabinets, standpipes, etc. the sprinkler contractor shall provide such drains as required to prevent spillage of water onto or within the building. Contractor shall coordinate with other trades and pay for

and/or provide floor drains, hub drains, catch basins, etc. needed for the maintenance and draining of the sprinkler system.

11. Samples: Submit two samples of each style of sprinkler head specified.

1.9 SUBMITTALS AT PROJECT CLOSEOUT

- A. Section - Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- B. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.
- C. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Provide a copy of NFPA 25 - "Standard for Inspection, Testing, and Maintenance of Water Based Fire Protection Systems."

1.10 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 13. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.
- D. Design system under direct supervision of a NICET III Certified Technician experienced in design of this work and licensed in the State of Louisiana. The Fire Protection contractor shall be licensed for fire protection work in the State of Louisiana.

1.11 REGULATORY REQUIREMENTS

- A. Conform to UL, FM.
- B. Perform Work in accordance with NFPA 13.
- C. Equipment and Components: Bear UL, FM, label or marking.
- D. Products Requiring Electrical Connection: Provide products that are listed and classified by Underwriters Laboratories Inc., or other testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.
- E. Fire Protection Contractor shall be licensed to perform fire protection systems design and installation in the State of Louisiana.

1.12 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1. Provide seven (7) days advanced notice to Owner's Representative.

1.13 DELIVERY, STORAGE, AND PROTECTION

- A. Section - Product Requirements: Transport, handle, store, and protect products.
- B. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.14 EXTRA MATERIALS

- A. Provide extra sprinklers under provisions of NFPA 13.
- B. Provide suitable wrenches for each sprinkler type.
- C. Provide metal storage cabinet in location designated.

PART 2 - PRODUCTS

2.1 SPRINKLERS

- A. Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation.
 1. Wrenches shall be provided by the sprinkler manufacturer that directly engage the hex-shaped wrench boss integrally cast in the sprinkler body.
- B. Both threaded and grooved sprinklers are accepted.
 1. UL listed and FM approved rigid coupling to join sprinklers with IGS profile grooved ends to matching 1" IGS outlets; Coupling consists of two cast copper-alloy housing segments for connection of ½", ¾", and 1" sprinklers. Coupling includes an EPDM Type A gasket, with zinc-plated cap screws conforming to ASTM F835, and nylon insert locknut. Installation-ready, for direct push installation without field disassembly. Rated for a working pressure to 175 psi.
- C. Suspended/Finished Ceilings
 1. Manufacturers:
 - a. Victaulic Series FL-QR/C
 - b. Viking Microfast -Quick Response Concealed Sin No. VK 462
 - c. Reliable SIN RA3415
 2. Type: Concealed Quick Response pendant type with push on thread off cover plate.
 3. Finish: Color by Architect.
 4. Cover Plate Finish: Color by Architect.
 5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
 6. Location: In center of modular ceiling tile
- D. Exposed Area Type:
 1. Manufacturers:
 - a. Victaulic Series FL-QR
 - b. Viking Microfast. Model M Sin No. VK 302
 - c. Reliable SIN RA 1414

2. Type: Standard coverage Quick Response Pendant type.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Exposed Area Type:

1. Manufacturers:
 - a. Victaulic Series FL-QR
 - b. Viking Microfast. Model M Sin No. VK 300
 - c. Reliable SIN RA 1425
2. Type: Standard coverage Quick Response Upright type.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

F. Sidewall Type - Quick Response:

1. Manufacturers:
 - a. Victaulic Series FL-QR/SW
 - b. Viking Model Microfast Quick Response SIN No. VK 305
 - c. Reliable SIN RA1435
2. Type: Quick response 175 psi rated horizontal sidewall type with matching push on escutcheon plate.
3. Finish: Brass
4. Escutcheon Plate Finish: Brass
5. Fusible Link: Glass bulb type temperature rated for specific area hazard

G. Exposed Area Type:

1. Manufacturers:
 - a. Victaulic Series FL-SR
 - b. Viking. Model M Sin No. VK 102
 - c. Reliable SIN RA1314
2. Type: Standard coverage Standard Response Pendant type.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

H. Exposed Area Type:

1. Manufacturers:
 - a. Victaulic Series FL-SR
 - b. Viking. Model M Sin No. VK 100
 - c. Reliable SIN RA 1325
2. Type: Standard coverage Standard Response Upright type.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

2.2 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Riser Check Alarm Valve:

1. Manufacturers
 - a. Victaulic Series 751 Series or UMC Riser Check Assembly
 - b. Viking Easy Riser Swing Check Valve Model E-1, F-1
 - c. Reliable Model G
2. Check type valve with divided seat ring, rubber faced clapper to automatically actuate electric alarm, with test and drain valve.

- B. Wet Pipe Sprinkler Zone Control Riser Valve Assembly:
1. Manufacturers
 - a. Victaulic Zone Control Riser Module Series 747M or UMC Floor Universal Floor Control Assembly
 - b. Viking Easy Pac
 - c. Reliable Model "CR"
 2. The module shall consist of a butterfly control valve, test and drain valve combination with appropriate orifice, a UL Listed and FM approved Flow Switch, and a UL Listed and FM approved pressure relief valve
- C. Electric Alarm Bell:
1. Manufacturers
 - a. Potter Electric Model MBA-6-24
 - b. System Sensor Model SSM 24-6
 2. Electrically operated red enameled gong.
- D. Fire Department Connections:
1. Manufacturers:
 - a. Potter Roemer Model 5761
 - b. Guardian Model 6224
 2. Type: Free standing type with chrome plated finish.
 3. Outlets: Four (4)-way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish.
 4. Drain: 3/4 inch automatic drip, outside.
 5. Label: "Auto. Sprinkler - Fire Department Connection".
 6. At the low point near each fire department connection, install a 90-degree elbow with drain connection to allow for localized system drainage. Basis of Design: Victaulic #10-DR.
 7. Sign: Provide metal sign that reads "FDC"
 - a. Lettering shall be minimum three (3) inches in height and colored RED.
- E. Supervisory Switches:
1. Manufacturers
 - a. Potter Electric Model OSYSU-2, PCVS
 - b. System Sensor. Model OSY-2, PIBV2
- F. Flow Switches:
1. Manufacturers
 - a. Potter Electric Model VSR-F
 - b. System Sensor Model WFD Series
- G. Test and Drain Valve
1. Manufacturers
 - a. Victaulic Series UTD (Universal Test and Drain)
 - b. AGF Model 1011A
 - c. Guardian Model 9210
 - d. Reliable Model "TD"
- H. Alarm Pressure Switches:

1. Manufacturers
 - a. Potter Electric Model PS10-2A
 - b. System Sensor Model EPS10-2
- I. High/Low Pressure Supervisory Switches:
1. Manufacturers
 - a. Potter Electric Model PS40-2A
 - b. System Sensor Model EPS40-2
- J. Flexible Sprinkler Hose Fitting for Fire Protection Service:
1. Manufacturer: FlexHead Industries, Inc. and Victaulic Vic-Flex AH2/AH2CC
 - a. Substitutions: Allowed if substitute product meets regulatory requirements, performance criteria and material specifications listed below.
 2. Description:
 - a. Regulatory Requirements: Provide flexible stainless steel hose fittings that comply with the following requirements:
 - i. In accordance with General Requirements contained in specification.
 - ii. In accordance with NFPA 13.
 3. Performance Criteria: Comply with the following to suit project requirements:
 - a. FM 1637 Approval Standard for Flexible Sprinkler Hose with Treaded End Fittings
 - b. UL 2443 Standard for Flexible Sprinkler Hose with Fitting for Fire Protection Service.
 - c. ICC-ES AC-156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and System
 4. Materials: Victaulic Vic-Flex Connection
 - a. Flexible Stainless Steel Sprinkler Drop System (with captured coupling style 108) may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or Victaulic Firelock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to a sprinkler head.
 - b. The drop shall include a UL approved Series AH1 with 3" bend radius; AH2 or AH2-CC braided hose with a bend radius to 2" to allow for proper installation in confined spaces.
 - c. The hose shall be listed for [(4) bends at 31" length]
 - d. Union joints shall be provided for ease of installation.
 - e. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place.
 - f. The braided drop system is UL listed for sprinkler services to 175 psi (1206 kPa) and FM Approved to 200 psi (1380 kPa)
 5. Materials: FlexHead Superflex Commercial Sprinkler Connection
 - a. FlexHead Superflex flexible stainless steel hose assemblies:
 - i. Straight Hose Assembly Lengths (3 ft. length, Model #2036SF-50), (4 ft. length, Model #2048SF-50), (6 ft. length, Model #2072SF-50)
 - 1) ½ inch outlet
 - 2) 175 psi maximum rated pressure.
 - 3) Fully welded non-mechanical fittings, braided,

leak-tested with minimum 1 inch true-bore internal

corrugated hose diameter made of 100% 304 stainless steel including end fittings.

- b. FlexHead Ceiling Bracket: Direct attachment type having integrated snap-on clip ends positively attached to the ceiling using tamper-resistant screws and removable attachment hub with set screw for attaching and adjusting flexible hose.
- 6. For Dry systems, in lieu of rigid connections to dry sprinkler heads, a Victaulic VicFlex™ dry sprinkler, Model VS1, may be used. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2" and allow for up to 4 bends.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NFPA 13
- B. Wrenches used to install the sprinkler heads shall be the wrench called for by the manufacturer of the sprinkler head. The use of any other wrench shall not be acceptable and contractor shall replace all heads which were improperly installed without the use of the correct sprinkler head wrench.
- C. Install equipment in accordance with manufacturers instructions.
- D. Install buried shut-off valves in valve box. Provide post indicator.
- E. Provide approved double detector check valve assembly at sprinkler system water source connection.
- F. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connections to allow full swing of fire department wrench handle.
- G. Locate outside alarm gong on building wall as indicated.
- H. Place pipe runs to minimize obstruction to other work.
- I. Do not install sprinkler heads that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.
- J. Sprinkler bulb protector shall be removed by hand after installation. Do not use tools or any other device(s) that could damage the bulb in any way, to remove the protector.
- K. Place piping in concealed spaces above finished ceilings.
- L. Center sprinklers in two directions in ceiling tile and provide piping offsets as required, dependent upon spacing and coordination with ceiling elements.
- M. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- N. Flush entire piping system of foreign matter.
- O. Install guards on sprinklers where indicated.

- P. Hydrostatically test entire system.
- Q. Require test be witnessed by Fire Marshal and Architect.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

3.3 PAINTING

- A. Refer to Section - "Mechanical General Provisions" for painting requirements and Architectural Specification - "Painting". Coordinate the painting requirements of this section with the Contractor. Painting is typically performed by the Division 9 Contractor. This Contractor, however, shall either perform specialized painting as called for below in the following conditions or he shall advise the Contractor prior to bidding of these painting requirements set forth as follows:
 - 1. All sprinkler risers in stairs/stairwells and riser closets shall be painted.
 - 2. All fire protection piping in Fire pump Room shall be painted.
 - 3. All exposed fire hose drops shall be painted.
 - 4. All fire protection piping in Exhibits Area shall be painted.
 - 5. All exposed fire protection piping in Central Plant shall be painted.
 - 6. Thoroughly clean all mechanical surfaces, requiring prime painting, of rust, loose scale, oil and grease.
 - 7. Dry all surfaces before painting.
 - 8. Paint only under proper ambient conditions.
 - 9. Do not paint over controls, or on equipment nameplates, factory labels or sprinkler heads.
 - 10. Prepare pipe, fittings, supports, and accessories for finish painting.
 - 11. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

3.4 TRAINING & DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 - 1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 - 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 1, Section- "Closeout Submittals" and Division 22, Section - "Basic Mechanical Requirements."
 - 3. Provide Service Manuals for each sprinkler system specified.
- B. Provide three (3) hours of factory authorized training.
 - 1. Refer to Section - "Mechanical General Provisions" for video taping requirements.
 - 2. Provide seven (7) days advanced notice to Owner's Representative.

3.5 INSPECTIONS AND TESTS

- A. All fees, etc. for the installation, inspection, or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the contractor.

- B. All inspections, examination, and tests required shall be arranged and paid for by the contractor as necessary to obtain complete and final acceptance of the Fire Protection System. The contractor shall deliver certificates of all such inspections to the Architect/Engineer.
- C. Maintenance Instructions to the Owners: After installation of this system is completed and before it is accepted by the owner, the sprinkler contractor shall instruct the maintenance personnel on the care and maintenance of this system. Included in these instructions shall be the following:
 - 1. Two (2) original copies of NFPA 25 shall be furnished to the owner's maintenance personnel.
 - 2. Full sized copy of AS-BUILT sprinkler drawings, showing any modified locations of sprinkler heads/piping.
 - 3. Full sized print of Louisiana State Fire Marshal reviewed/stamped submittal including material data sheets, hydraulic calculations, and shop drawings.
 - 4. Normal conditions of the sprinkler system.
 - 5. Weekly test of alarm valve.
 - 6. Weekly test of waterflow indicator.
 - 7. Semi-Annual test of alarm valve and water flow indicator.
 - 8. Abnormal conditions and corrections.
 - 9. Maintenance.
- D. After the above instruction has been completed, this contractor shall notify the Architect/Engineer by letter of such. This letter should state the name(s) of the individuals receiving instructions.

3.6 INSPECTIONS

- A. For a period of one (1) year after acceptance, this contractor shall make two (2) inspections on the sprinkler system. One shall be six (6) months after acceptance and the other one (1) year after acceptance. This contractor shall furnish the owner with all inspection certificates after each inspection and furnish the architect with two copies of the inspection certificate. After one year, the owner shall be responsible for arranging for inspections by a qualified sprinkler contractor.

END OF SECTION 21 13 19

SECTION 22 00 00 – PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL



1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Furnish all labor and material necessary to provide and install the complete plumbing portion of this Contract as called for herein and on accompanying drawings. Parts of the plumbing division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in the Plumbing Division have been included if he chooses to accept separate bids.
- B. It is the intent of this specification that all materials with temperatures below ambient conditions or conveying any fluid/gas at temperatures below 70 deg. F be insulated to completely eliminate the potential for condensation. Unless specified elsewhere in these specifications, for materials that do not require and requiring occasional access, use 2" thick closed cell rubberized insulation with re-sealable fabric joints (hook and loop type).
- C. Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- D. It is the intention of these specifications that all plumbing systems shall be furnished complete with all necessary valves, controls, insulation, piping devices, equipment, etc. necessary to provide a satisfactory installation that is complete and in good working order.
- E. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.
- F. This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.
- G. Provide as work of this Division (unless clearly and specifically indicated as a requirement of the Division 26 contractor on the Division 26 drawings) the following:
 - 1. 120V power to all fixtures, control panels, unit controllers, field devices, etc. as required.
 - 2. Wiring of any remote start/stop switches controlling Division 22 equipment.

1.3 DEMOLITION

- A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.

- B. Contractor shall coordinate demolition with owner. All equipment shall be salvaged for owner. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor's expense.
- C. Contractor shall coordinate all work with general contractor and phase work as required by project.
- D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.
- E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.
- F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.
- G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.
- H. All shutdown of services shall be done at night during a time period approved by owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

1.4 GROUNDS AND CHASES

- A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

1.5 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor, with the various trades being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimble without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

1.6 FILL AND CHARGES FOR EQUIPMENT

- A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

1.7 BIDDING REQUIREMENTS AND RESPONSIBILITIES

- A. Prime bidder is responsible for all work, of all trades and sub-contractors bidding this project. It is the prime bidder's responsibility, prior to submitting a bid to ensure that sub-contractors coordinate all aspects of the work between trades, sub-contractors, etc. to the fullest extent possible.
- B. Prime bidder shall ensure that all sub-contractors, suppliers, equipment vendors, etc., obtain all necessary and pertinent contract document information pertaining to their work prior to the submission of a bid. Contractor shall realize that different sub-contractors may furnish equipment, accessories, devices, etc. necessary for a complete and working installation that require provision of services by another sub-contractor or trade.

- C. Bidders of all or any portions of this section or division are required to review all contract documents including but not limited to Architectural drawings, Structural drawings, Mechanical drawings, Plumbing drawings, Electrical drawings, etc. to coordinate requirements and responsibilities with and through prime bidder.
- D. Bidders of all or any portions of this section or division, by furnishing a bid on a portion of the prime contract are indicating that they have received all contract documents and coordinated services provided under their portion of the work with the prime bidder; they are indicating that they have expressed any pertinent questions (which would result from a detailed, thorough review of the entire set of contract documents) to the prime bidder in accordance with Division 00 & 01 requirements, prior to bidding.
- E. All timely, pertinent, questions provided in writing prior to bids, in accordance with Division 00 & 01 requirements, will be clarified, defined, or otherwise explained in a written addendum and/or addendums prior to bids, in accordance in Division 00 & 01 requirements.
- F. It is not the intention of these contract documents to leave any issue relating to coordination between trades or sub-contractors vaguely defined. The intention is to define all issues, coordination matters, equipment requirements, sizes, routing, etc. to the satisfaction of the prime bidder, prior to receipt of bids.
- G. Bidders of all or any portions of this section or division, by virtue of the submission of a bid to the prime bidder, are indicating that they have reviewed the entire set of contract documents with due diligence and regard for the Owner's desire for a comprehensive and complete bid proposal; that they have expressed all concerns or questions requiring clarification on matters of coordination between trades and/or sub-contractors; that they have expressed any such concerns or questions in writing in accordance with Division 00 & 01 requirements.
- H. Prime bidders, by submission of a comprehensive bid on the project are indicating that the subcontractors selected in their bid have complied with all Division 00 & 01 requirements, that they have indicated in writing, prior to bidding, all questions or concerns requiring clarification and/or explanation and have documented any and all specific exclusions involving work that would generally be considered to be work of their trade. The prime bidder shall coordinate all work so that anything excluded by the bidder of all or any portions of this section or division, have been addressed prior to bids in one of the following manners:
 - 1. The work has been confirmed, by the prime bidder, to be work of another trade or subcontractor (whose proposal is also being accepted).
 - 2. Clarification of the matter has been made through the prime design professional via written addendum and is clearly and mutually understood by the prime bidder and the party raising the issue/question, or seeking clarification.
 - 3. The work has been accepted as the responsibility of the prime contractor directly.

1.8 MATERIAL AND EQUIPMENT

- A. The term "provide" when used in the Contract Documents shall mean "furnish and install" and includes all items necessary for the proper execution and completion of the Work.
- B. Specific reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect expressed in writing is equal to that specified.
- C. Coordinate and properly relate all Work of this Division to building structure and work of all other trades.

- D. Visit premises and become thoroughly familiar with existing conditions; verify all dimensions in field. Advise Architect of any discrepancies prior to Bid Date in accordance with Division 00.
- E. Do not rough-in for any item or equipment furnished by others or noted "Not in Contract" (NIC), without first receiving rough-in information from physically examining the existing equipment, receiving specific cut sheet information from the Owner's representative, other trades and/or Architect. Rough-in services for "NIC" equipment as required, as the work progresses.
- F. Provide storage and protection for all equipment and materials in accordance with requirements of Division 00 & 01. Replace any equipment and materials damaged by improper handling, storage, or protection, at no additional cost to Owner.
- G. Keep premises clean in accordance with requirements of Division 00 & 01.

1.9 SUBSTITUTIONS

- A. Substitutions are allowed under La. R.S. 38:2291 and La R.S. 38:2292. Any requests for prior approval (as provided for under La. R.S. 38:2295) including any re-submitted data, shall be received by the Architect/Engineer a minimum of fourteen (14) working days prior to bid date. The Contractor shall recognize that it may be necessary to submit certain requests for prior approval sooner than the final date listed in the Instructions to Bidders, depending upon the complexity and completeness of the submittal. If, in the opinion of the Architect/Engineer, there is neither sufficient time available nor adequate descriptive data attached to the submittal, the submittal will not be considered. Except as otherwise specified, materials and equipment shall be new and bear the approval label of the Underwriters Laboratories, Inc. for the type of installation required.
- B. Design of systems is based on specific equipment. If the use of other manufacturer's equipment, even though approved by Architect, involves additional cost due to space requirements, foundation requirements, increased mechanical or electrical services, the cost of such extra work shall be borne by Contractor. Even though a manufacturer's name appears in the Contract Documents as having acceptable equipment, their equipment with different model numbers shall be classified as being a substitute to the equipment originally designed for and named in the Contract Documents. Substitute equipment, materials, etc., will not be allowed to deviate from Contract Document requirements. Furnish all options specified or reasonably implied from the contract documents. Specifically identify any variance in regard to submittal versus specified performance on the cover sheet of each submittal.

1.10 POST-BID VALUE ENGINEERING (V/E):

- A. While it may be in the project Owner's interest to consider the first cost money saving that may be generated via alternatives and options generated via participation in Value Engineering, Division 22 contractor shall realize that substantive offers of Value Engineering (V/E), if accepted by the Owner, constitute a design-build agreement (offer and acceptance) with the owner, and drastically change the design concept of the project, as developed by the Professional of Record identified on the Contract Documents.
- B. Should contractor offer, and the owner accept value engineering options that alter aspects of the system design, equipment, performance and/or performance verification or monitoring of respective systems, Division 22 contractor shall provide duly licensed professional engineering consultants working on behalf of the Division 22 contractor (including sub-contractors and equipment vendors/manufacturers) to review, approve and take professional responsibility for performance and suitability of V/E hybrid systems, materials or operational

changes related to respective V/E items. The Division 22 contractor's licensed professional engineering consultants and the Division 22 contractor assume any and all responsibility for the design and suitability in terms of performance, of hybrid systems installed, as Division 22 contractor's Professional of Record, absolving the original project Professional of Record (identified on the original Contract Documents, released for the original project Bid/Negotiation) from responsibility for the V/E hybrid systems portion of the work.

- C. Division 22 contractor, via the offer and acceptance of value engineering items on the project agrees to provide professional engineering design services and take full and complete responsibility for the hybrid design. Further, the Division 22 contractor's (V/E Items) professional of record (either employees, or independent consultants to the Division 22 contractor) through the offer and acceptance of V/E items, agree to indemnify and hold harmless the project owner, the owner's original A/E team (Professional of Record on behalf of the owner for the original Contract Documents) their heirs and assigns in regard to the V/E changes and their impact on the Division 22 systems altered, affected or modified, in whole or in part. The Professional of Record shown on the original Contract Documents in regard to the systems altered, adjusted, revised, modified or otherwise affected by the value engineering items implemented, shall be absolved of design responsibility as a result of implementation of V/E items, and their original use of Engineering Seals used for original Contract Documents, shall not apply.

1.11 DRAWINGS AND SPECIFICATIONS

- A. The specific intent of these Contract Documents is to provide the various systems, equipment, etc. to the Owner complete and in a thoroughly calibrated functional condition.
- B. The Drawings shall not be construed as shop drawings. In the event of a possible interference with piping or equipment of another trade, items requiring set grade and elevations shall have precedence over other items should any major interference develop, immediately notify the Architect.
- C. In laying out Work, refer to mechanical, electrical, structural, and architectural drawings at all times in order to avoid interference and undue delays in the progress of the Work.

1.12 CODES AND REGULATIONS

- A. Work shall be in full accord with the most stringent interpretation of the State Sanitary Code, local ordinances, building codes, and other applicable national, local, and state regulations.
- B. Equipment shall conform to requirements and recommendations of the National bureau of Fire Underwriters and National Fire Protection Association (NFPA).
- C. Items provided under this Division shall comply with the American National Standards Institute (ANSI) "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People," ANSI A 117.1
- D. In the possible event of conflict between codes or regulations and Contract Documents, the most stringent interpretation of either shall govern (provided it exceeds the requirements of other codes). In the event of an irreconcilable difference between codes or regulations notify the Architect/Engineer immediately.
- E. In addition to the codes heretofore mentioned, all work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:
 - 1. National Electrical Code (NEC)

2. National Fire Protection Association (NFPA)
 3. American Society of Mechanical Engineers (ASME)
 4. American Gas Association (AGA)
 5. Underwriters Laboratories (UL)
 6. International Plumbing Code (IPC) with Louisiana Amendments
- F. All materials, equipment and accessories installed under this Contract shall conform to all rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. All materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.
- G. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.
- H. All unfired and fired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel. Contractor shall provide and pay for first operating certificate as per State Fire Marshal Regulations.

1.13 FEES, PERMITS, AND TAXES

- A. Obtain and pay for permits required for the Work of this Division. Pay fees in connection therewith, including necessary inspection fees.
- B. Pay any and taxes levied for Work of this Division, including municipal and/or state sales tax where applicable.
- C. All permits, fees, certificates, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor.
- D. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.
- E. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.
- F. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.
- G. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

1.14 MANUFACTURER'S DIRECTIONS

- A. Install and operate equipment and material in strict accord with manufacturer's installation and operating instructions. The manufacturer's instructions shall become part of the Contract Documents and shall supplement Drawings and Specifications.

1.15 SUBMITTAL DATA

- A. Submit shop drawings, project data, and samples in accordance with requirements of Division 00 & 01.
- B. Shop drawings shall consist of published ratings or capacity data, detailed construction drawings for fabricated items, wiring and control diagrams, performance curves, installation instructions, manufacturer's installation drawings, and other pertinent data. Submit drawings showing revisions to equipment layouts due to use of alternate or substitute equipment.
- C. Where approved manufacturers and suppliers of equipment, materials, etc. are unable to fully comply with Contract Document requirements, specifically call such deviations to attention of Architect on submittals. Type deviations on a separate sheet; underlined statements or notations on standard brochures, equipment fly sheets, etc. will not be accepted.
- D. Approval of submittals shall not relieve Contractor from furnishing required quantities and verifying dimensions. In addition, approval shall not waive original intent of Contract Documents.
- E. Failure to obtain written approval of equipment shall be considered sufficient grounds for rejection of said equipment regardless of the stage of completion of the project.

1.16 REVIEW OF MATERIALS:

- A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of ten (10) days prior to the Bid Date.
- B. Submission shall include the manufacturer's name, model number, rating table and construction features.
- C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. The contractor shall base his bid solely on those items specified or included in the "prior approval addendum", as no other item will be acceptable.
- D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.
- E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.
- F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even through approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.

- G. Shop drawings shall be submitted in accordance with Section 013300. These submittals shall be supplied as part of this Contractor's contract. Any drawings not approved shall be resubmitted until they are approved. Submit all shop drawings at the same time. No separate items will be accepted.

1.17 PROJECT RECORD DOCUMENTS

- A. Keep Project Record Documents in accordance with requirements of Division 00 & 01.
- B. During construction period, keep accurate records of installations made under this Division, paying particular attention to major interior and exterior underground and concealed piping, ductwork, etc.
- C. The Contractor shall obtain at his cost, two sets of blueline prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.
- D. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, all such variances on the blueline print in red. The original bluelines shall be returned to the Architect for documentation.
- E. Provide electronic (PDF) copies of all documentation included in Final Report.
- F. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.
- G. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.
- H. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
- I. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases, this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.
- J. The following requirements apply to all "As-Built" drawings:
 - 1. They shall be maintained at the Contractor's expense.
 - 2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
 - 3. Additional drawings shall be provided as necessary for clarifications.
 - 4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
 - 5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

1.18 EXCAVATING AND BACKFILLING

- A. Provide excavating and backfilling necessary for Work of this Division. Comply with provisions of Division 02, Site Work, if applicable.
- B. Trenches shall be inspected by Code Authorities and/or Owner's Representative before and after piping is laid. Give Owner's Representative 24-hour notice for each inspection. If any trenches are filled without Owner's Representative inspection and as subsequently found to be deficient, the trenches shall be uncovered, inspected, and then re-filled, if requested by Owner's Representative.
- C. Provide minimum 18 inches of cover or in compliance with local published frost line data (if greater than 18 inches) to finish grades or paving at water piping.
- D. For piping, provide bell holes at trench bottom to assure uniform bearing. Accurately grade trench bottoms by instrument before laying any pipe.
- E. Protect and maintain trenches in dry condition until piping has been inspected and approved. Immediately after approval, backfill trenches in tamped layers.
- F. Compact fill to satisfaction of Architect and/or Owner's Representative.

1.19 CUTTING AND PATCHING

- A. Comply with requirements of Division 00 & 01 regarding cutting and patching. Locate and timely install sleeves as required to minimize cutting and patching.
- B. Cutting, fitting, repairing, patching, and finishing of Work shall be done by craftsmen skilled in their respective trades. Where cutting is required, cut in such a manner as not to weaken structure, partitions, or floors. Holes required to be cut must be cut or drilled without breaking out around the holes. Where patching is necessary in finished areas of the building, the Architect will determine the extent of such patching and refinishing.
- C. Repairing Roadways and Walks: Coordinate all roadway work with authorities having jurisdiction. Cut and/or bore under roadways for connection of utilities as required. Coordinate work through General Contractor. Where this contractor cuts or breaks roadways, or walks to lay the piping, he shall repair or replace these sections to match existing, unless specifically identified as the responsibility of others.

1.20 PAINTING

- A. Painting shall be provided by General Contractor's painting sub-contractor, unless specified otherwise. Leave exposed piping, materials, and equipment clean and free of rust, grease, dirt, etc. before and after painting.
- B. Factory finished equipment, fixtures, and materials which are marred, chipped, scratched, or otherwise unacceptable shall be repaired or replaced under this Division to Architect satisfaction, at no additions cost to Owner.
- C. Coordinate all painting requirements with prime bidder prior to bids.
- D. Paint all exposed piping inside and outside of building. Label all piping after painting in accordance with Section 230553. Utilize industry standard paint colors for respective system unless directed otherwise by Architect. Review proposed color scheme with Architect/Engineer prior to ordering materials.

1.21 CLEANING AND ADJUSTING:

- A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

1.22 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.
- B. Copies of shop drawings will not be acceptable as operation and maintenance instructions.
- C. This information shall be bound in plastic hardbound notebooks with the job name, Architect and Engineer names permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.
- D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.
- E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.
- F. Contractor shall provide electronic (PDF) format copies of all Operation and Maintenance Instruction on disk.

1.23 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.
- B. If the Contractor's office is in excess of a fifty (50) mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The name of the contractor appointed to provide emergency services shall be submitted to the Architect for his approval.

1.24 LOCAL CONDITIONS

- A. The location and elevation of all utility services is based on available surveys and utility maps and are believed to be reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.
- B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.

- C. In case major changes are required, this fact, together with the reasons therefore, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions, and expenses necessary for the successful completion of the project.

1.25 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes, etc. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect for approval before proceeding. Extra charges shall not be allowed for these changes.
- B. Only typical details are shown on the Plans. In cases where the Contractor is not certain about the installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.
- C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

1.26 VALVE TAGS

- A. Secure metal tags to all valves. Labeling on all valve tags shall include type of system the valve controls and the area of building, zone, or equipment number affected by valve operation. Tag shall be 2" minimum diameter brass, engraved with code number, service and size. A framed list of the valves, giving manufacturer's name, model number, type and location shall be mounted in the main basement equipment room.

1.27 LABELING PLUMBING EQUIPMENT

- A. All equipment furnished under the contract documents shall be labeled with permanent laminated plate secured to equipment. Units shall be labeled as indicated on plans and schedules.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 22 00 00



SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes the furnishing and installation of common work results for plumbing which includes the following related components:
 - 1. Strainers
 - 2. Water hammer arresters
 - 3. Valves
 - 4. Hydrants
 - 5. Hose bibbs and sill faucets
 - 6. Backflow preventers
 - 7. Pressure regulating and reducing valves
 - 8. Pressure-temperature relief valves

1.3 SUMMARY

- A. This Section specifies the water distribution piping system, including potable cold, hot, and recirculated hot water piping, fittings, and specialties within the building.

1.4 DEFINITIONS

- A. Water Distribution Piping: A pipe within the building or on the premises which conveys water from the water service pipe or meter to the points of usage.
- B. Water Service Piping: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.

1.5 SUBMITTALS

- A. Refer to Division 01 and Basic Mechanical Requirements for administrative and procedural requirements for submittals.
- B. Product Data: Submit manufacturer's product data for the following products that apply to this project scope:
 - 1. Strainers
 - 2. Water hammer arresters
 - 3. Valves
 - 4. Hydrants
 - 5. Hose bibbs and sill faucets
 - 6. Backflow preventers
 - 7. Pressure regulating and reducing valves
 - 8. Pressure-temperature relief valves

- C. Coordination Drawings: Prepare and submit coordination drawings for Water Distribution Piping in accordance with Division 23 - Basic Mechanical Requirements.
- D. Maintenance Data: Submit maintenance and operating data. Include this data in maintenance manual in accordance with requirements of Division 01 and Division 23 - Basic Mechanical Requirements for the following products that apply to this project scope:
 - 1. Strainers
 - 2. Valves
 - 3. Hose bibbs and sill faucets
 - 4. Backflow preventers
 - 5. Pressure regulating and reducing valves
 - 6. Pressure-temperature relief valves
- E. Quality Control Submittals:
 - 1. Submit welders' certificates specified in Quality Assurance below.
 - 2. Submit certification of compliance with ASME and UL fabrication requirements specified in below.
 - 3. Submit reports specified in Part 3 of this Section.

1.6 QUALITY ASSURANCE

- A. Codes and Standards
 - 1. Plumbing Code Compliance: Comply with applicable portions of Edition 2021 of the International Plumbing Code.
 - 2. ASME Compliance: Fabricate and stamp pressure-temperature relief valves to comply with ASME Boiler and Pressure Vessel Code.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store pipe in a manner to prevent sagging and bending.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate the installation of pipe sleeves for foundation wall penetrations.

1.9 MAINTENANCE

- A. Spare Parts:
 - 1. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer uniformity: Conform with the requirements specified in Basic Mechanical Requirements, under "Product Options" for the following water distribution piping products.

2.2 VALVES

- A. Gate, ball, butterfly, check, and drain valves are specified in Section 220519 "Plumbing Piping".
- B. Balance Cocks:
 - 1. Threaded Ends 2" and Smaller: Class 125, bronze body, bronze plug, screwdriver operated, straight or angle pattern.
 - 2. Soldered Ends 2" and Smaller: Class 125, bronze body, bronze plug, screwdriver operated, straight or angle pattern.

2.3 PIPING SPECIALTIES

- A. Water Hammer Arresters: Bellows type, with stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.
- B. Basket Strainers: Cast-iron body, 125 psi flanges, bolted type or yoke type cover; with removable non-corrosive perforated strainer basket having 1/8" perforations and lift-out handle.
- C. Flexible connectors: Stainless steel bellows with a woven flexible bronze wire reinforcing protective jacket; rated for 150 psig water working pressure, 250 deg F operating temperature and suitable for up to maximum 3/4" misalignment. Connectors shall be a minimum of 12" long and have threaded or flanged ends; sweat ends are not acceptable.
- D. Hose Bibbs: Bronze body, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet.
- E. Recessed Non-Freeze Wall Hydrants: Cast-bronze box, with chrome plated face, tee handle key, vacuum breaker, hinged locking cover, 3/4" inlet, and hose outlet. Bronze casing shall be length to suit wall thickness.
- F. Floor Level Non-Freeze Hydrants: Cast-bronze hydrant, with rough bronze box, tee handle key, drain hole, vacuum breaker, hinged locking cover, 3/4" inlet, and hose outlet. Bronze casing shall be length to suit depth of bury.
- G. Backflow Preventers: Reduced pressure principle assembly consisting of shutoff valves on inlet and outlet, and strainer on inlet. Assemblies shall include test cocks, and pressure-differential relief valve located between 2 positive seating check valves, and comply with requirements of ASSE Standard 1013. Backflow preventer shall be with drain funnel.
- H. Pressure Regulating Valves: Single seated, direct operated type; having bronze body with integral strainer, and complying with requirements of ASSE Standard 1003.
- I. Relief Valves:
 - 1. Provide proper size for relief valve, in accordance with ASME Boiler and Pressure Vessel Codes, for indicated capacity of the appliance for which installed.
 - 2. Combined Pressure- Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 deg. F, and pressure relief at 150 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all water distribution piping may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Examine rough-in requirements for plumbing fixtures and other equipment having water connections to verify actual locations of piping connections prior to installation.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 JOINING PIPES AND FITTINGS

- A. Copper Tubing: Solder joints in accordance with the procedures specified in ANSI B9.1, using lead free piping, solder, and flux. Lead free, when used with respect to solder and flux, refer to solder and flux containing not more than 0.2 percent lead. When used with respect to pipe and fittings, lead free refers to pipe and fittings containing not more than 6.0 percent lead.

3.3 PIPING INSTALLATION

- A. Refer to the separate Division 230020 section: "Basic Mechanical Requirements", for general piping installation instructions.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

3.4 INSTALLATION OF VALVES

- A. Installation requirements for general duty valves are specified in a separate Section of Division 23.
- B. Sectional Valves: Install sectional valves on each branch and riser, close to main. For sectional valves 2" and smaller, use ball valves; for sectional valves 2-1/2" and larger, use gate or butterfly valves.
- C. Shutoff Valves: Install shutoff valves on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated. For shutoff valves 2" and smaller, use ball valves; for shutoff valves 2-1/2" and larger, use butterfly valves.
- D. Drain Valves: Install drain valves on each plumbing equipment item, located to completely drain equipment for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to completely drain distribution piping system. For drain valves 2" and smaller, use gate or ball valves; for drain valves 2-1/2" and larger, use gate or butterfly valves.
- E. Check Valves: Install swing check valves on discharge side of each pump, and elsewhere as indicated.
- F. Balance Cocks: Install in each hot water recirculating loop, discharge side of each pump, and elsewhere as indicated.

3.5 INSTALLATION OF PIPING SPECIALTIES

- A. Install pressure regulating valves with inlet and outlet shutoff valves, and balance cock bypass. Install pressure gage on valve outlet.

3.6 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold-water piping runouts to fixtures of sizes indicated on plans. Connect cold water to hot and cold-water faucet connections where hot water is not provided.
- B. Mechanical Equipment Connections: Connect hot and cold-water piping system to mechanical equipment. Provide shutoff valve and union for each connection, provide drain valve on drain connection. For connections 2-1/2" and larger, use flanges instead of unions.

3.7 FIELD QUALITY CONTROL

- A. Inspections:
 - 1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the Architect.
 - 2. During the progress of the installation, notify the Architect, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the Architect.
 - 3. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
 - 4. Final Inspection: Arrange for a final inspection by the Architect to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
 - 5. Reinspections: Whenever the Architect finds that the piping system will not pass the test or inspection, make the required corrections, and arrange for reinspection by the Architect.
 - 6. Reports: Prepare inspection reports, signed by the Architect.
- B. Piping System Test:
 - 1. Test for leaks and defects all water distribution piping systems. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
 - 2. Leave uncovered and unconcealed all water distribution piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.
 - 3. Cap and subject the piping system to a static water pressure of 50 psi above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to stand for a period of 4 hours. Leaks and loss in test pressure constitute defects which must be repaired.
 - 4. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
 - 5. Prepare reports for all tests and required corrective action.

3.8 ADJUSTING AND CLEANING

- A. Cleaning and Disinfecting:
 - 1. Purge all new water distribution piping systems and parts of existing systems, which have been altered, extended, or repaired prior to use.

2. Reports:
 - a. Prepare reports for all purging and disinfecting activities.

3.9 STERILIZATION

- A. Sterilize 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 05 00



SECTION 22 05 19 – PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes the following basic mechanical materials and methods to complement other Divisions and Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Pipe Specialties.
 - 3. Sleeves.
 - 4. Valves and Unions.
 - 5. Shock Absorbers.
 - 6. Escutcheons.
 - 7. Flashing.
 - 8. Access Panels.
 - 9. System Accessories.
- B. Pipe and pipe fitting materials are specified in individual piping system Sections.

1.3 ELECTRICAL WORK

- A. All electrical equipment shall have the U.L. Label and shall meet the standards of the National Electrical Code and NEMA.

PART 2 - PRODUCTS

2.1 PIPE:

- A. Sanitary Sewer Waste Lines Above Slab (PVC):
 - 1. Piping above slab, unless otherwise shown or specified, shall be constructed of solid wall Schedule 40 PVC "DWV" plastic pipe and fittings conforming to ASTM D265 and ASTM D1785 with solvent welded joints.
- B. Sanitary Sewer Waste Lines Below Slab (PVC):
 - 1. Piping below slab, unless otherwise shown or specified, shall be constructed of solid wall Schedule 40 PVC "DWV" plastic pipe and fittings conforming to ASTM D265 and ASTM D1785 with solvent welded joints.
- C. Sanitary Sewer Vent Lines Above Slab (PVC):
 - 1. These shall be constructed of solid wall Schedule 40 PVC "DWV" plastic pipe fittings conforming to ASTM D2665 and ASTM D1785 with solvent welded joints.

2. Sanitary sewer pipe penetrating concrete slabs shall be wrapped with Virginia Chemical K-501, Benjamin Manufacturing Model 6200, or equal foam insulation tape.
- D. Domestic Cold and Hot Water Lines:
1. All such lines shall be Government Type "L", hard copper water tubing of standard weight and thickness as made by Mueller, Chase, Anaconda or equivalent, unless indicated otherwise. Use 95-5 lead-free solder on all piping above slab. Use Silfos 1000° lead-free solder on all piping beneath the slab.
 2. In certain areas, type "L" soft copper without joints below slab shall be used only where indicated on the Plans. Piping shall be completely insulated per Section 220700.
 3. Domestic cold-water lines penetrating concrete slabs shall be wrapped with "Protect-O-Sleeve" vinyl flexible tube as manufactured by Robert H. Harris Co., or equivalent. Sleeve shall have a minimum thickness of .025" (0.635 mm).
 4. Domestic hot water lines shall be insulated at all penetrations through slab per insulation (see Section 220700).
 5. Domestic cold-water piping within 5'-0" of building may be Schedule 40 PVC plastic pipe with solvent welded joints, or slip joint fittings with EPDM seals. Provide thrust blocks all at changes in direction. Installation shall be in accordance with manufacturer's recommendations.
- E. Water Heater Relief Lines:
1. These shall be Government Type "L" hard copper.
- F. Trap Primer Lines:
1. All such lines shall be Type "L" soft copper, without joints.
- G. Storm Drain Piping (PVC):
1. All such piping shall be Schedule 40 PVC plastic pipe and fittings conforming to ASTM D2665 and ASTM D1785 with solvent welded joints.
 2. Contractor shall support all joints and elbows rigidly. All elbows below vertical rises shall be supported rigidly within 18" of the elbow.
- H. Storm Drain Piping - Below Slab:
1. PVC Schedule 40 solid wall pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Injection molded PVC DWV fittings shall conform to ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. All systems shall utilize a separate waste and vent system. Pipe and fittings shall conform to NSF International Standard 14. Installation shall comply with the latest installation instructions published by the manufacturer and shall conform to all applicable plumbing, building, and fire code requirements. Buried pipe shall be installed in accordance with ASTM D2321 and ASTM F 1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVS compounds. System shall be hydrostatically tested after installation.

2.2 PIPE SPECIALTIES

- A. Dielectric unions shall be used between copper and iron pipe.

2.3 PIPE WARNING TAPE AND TRACER WIRE

- A. Provide warning tape for buried piping as per the following:

1. During the backfilling process, all PVC and Ductile Iron mains, service lines and system appurtenances shall have a continuous warning tape placed immediately above them and throughout their length at a depth of eighteen (18) inches above the utility line surface.
2. The tape shall be six (6) inches wide. Tape material shall be formulated from 100 percent virgin polyolefin resins. Resins shall be pigmental for chemical stability and resistance to sulfide staining (color fastness).
3. Tape shall be constructed by the mechanical (non-adhesive) lamination of two plies of three layers blown film in such a manner as to produce a bi-axially oriented structure. The tape shall be able to provide a 700 percent elongation prior to rupture as per ASTM-D882.
4. The tape shall meet or exceed the standards provided in the Materials Specification List, included in these Standards. The warning tape shall be manufactured with a permanent APWA line color pigment at a maximum of every thirty (30) inches along its length, be imprinted with a continuous warning message as follows:
 - a. "CAUTION: (State Type) LINE BURIED BELOW"
5. At tees, tape ends, etc., the warning tape shall be tied together (spliced) with knot to create a continuous warning tape throughout the length of the pipeline and associated branch lines, appurtenances, etc.

- B. Provide tracer wire for buried piping as per the following:

1. In addition to the installation of warning tape, copper tracing wire is to be installed with all PVC mains. This includes all mains, and individual hydrants. The tracing wire shall be taped, using electrical tape, on top of the pipe at ten (10) foot centers, for the total length of the pipe.
2. The tracing wire shall be 12 AWG (Average wire gauge), solid core, copper wire (solid core meaning one (1) single continuous strand of copper wire). In addition, the wire insulating coating (jacket) shall be blue in color and shall have 45 mils of polyethylene insulation thickness and high molecular weight. In addition, the tracing wire shall be HMW-PE and rated for UL 600V construction. The wire shall be suitable for wet or dry applications.
3. The wire size (gauge) shall be continuously affixed (printed on) the entire length of all tracing wire coating and shall be easily read.
4. Where a splice is required, or when a three (3)-way splice is necessary, the wires shall be joined together with an appropriate size (blue) wire nut which shall then be placed inside a 3M brand Direct Bury Splice kit (DBR), or approved equal, of appropriate size. No bare wire shall be left exposed anywhere. All wires shall be spliced to all other wires for a continuous tracing wire system.
5. On all hydrants and above ground appurtenances, the tracing wire shall be run up and protected. This wire end shall not be bare, but shall have the coating jacket intact. Location and frequency of test boxes shall be as directed by P.M., or designee. Test boxes shall be required where hydrants are not used or where hydrant spacing exceeds 500 feet.
6. No electrical connections of the tracing wire to any metal pipes or metal service lines will be allowed and care shall be taken to ensure that the tracing wire is not damaged during installation.

7. The tracing wire will be tested for continuous signal (continuity test) and shorts to ground across all main and service lines before asphalt is installed, and prior to sub grade preparation. Tracing wire must be able to conduct a continuous signal before pipe is accepted.

2.4 PIPE HANGERS AND SUPPORTS

- A. This Contractor shall furnish and install all foundations and supports required for his equipment unless indicated otherwise on the Drawings.
- B. This Contractor shall furnish and install all escutcheons, inserts, thimbles, hangers, etc. required for the proper support and installation of his equipment and piping and he shall cooperate with other trades in locating and placing these items.

2.5 PROVIDE SLEEVES FOR ALL PIPES PASSING THROUGH WALLS, FLOORS, BEAMS, ETC.

- A. Sleeves passing through structural members or concrete footings shall be of cast iron or Schedule 40 steel pipe. Sleeves passing through nonstructural walls or floors shall be of 26-gauge galvanized iron. Joints between sleeves and pipes passing through floors shall be made weather tight with plastic materials. Where pipes pass through water proofing membrane, flashing sleeves shall be installed.
- B. Provide Grinnell, Fee & Mason, or equivalent malleable iron split ring hangers with rod supports throughout. Strap hangers or wire will not be accepted.
- C. Maximum spacing of hangers for cast iron pipes shall be 5 ft.; for other than soil, use 10 ft.
- D. Provide galvanized iron shields between hangers and pipe covering.
- E. Provide Grinnell, Fee & Mason, Crane or equivalent heavy steel riser clamps on vertical risers at floors to support pipes.
- F. Provide producer specialty, Jones Manufacturing or equal chrome plated brass escutcheons wherever pipes pass through floors, walls, or ceilings in exposed or finished areas.
- G. All piping projecting from chases shall be rigidly supported in the wall or chase. Loosely supported fixtures or accessories will not be accepted.

2.6 VALVES AND UNIONS

- A. Furnish and install all valves, unions, stops, connections, etc. shown on plans and necessary to make a complete system in working order. Provide valves on inlet and outlet of all equipment and fixtures and on branch lines to fixtures or groups of fixtures.
- B. Ball Valves, 3" and smaller, rated for 150 PSI saturated steam pressure, 600 PSI WOG pressure; shall be 2-piece construction, bronze body conforming to ASTM B-62, conventional port, chrome-plated brass ball, replaceable TFE seats and seals, blow-out proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold-water service of NIBCO Design S-580-70, Milwaukee BA-150-S or equal, threaded ends of heating hot water and low pressure steam of NIBCO Design T-580-70, Milwaukee BA-100-S or equal. At Contractor's option, Victaulic Style 722 or 721 ball valves may be used.
- C. All valves, unions, etc. where pipe is chrome plated shall have similar finish. All exposed supplies to plumbing fixtures shall be chrome plated.
- D. Domestic water valves (below grade): M & H AWWA Series C-509 resilient gate valve with low torque operation, positive shut-off, O- Ring seals, full epoxy coating and square valve

stem end. Provide two (2) adjustable "TEE" handle valve wrenches to be turned over to the owner after construction is complete.

- E. Gate Valves, 2-Inch and Smaller: MSS SP-80; Class 125, body and bonnet of ASTM B 62 cast bronze; with threaded or solder ends, solid disc, copper-silicon alloy or bronze stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Provide Class 150 valves meeting the above where system pressure requires.
- F. Gate Valves, 2-1/2-Inch and Larger: MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B; with flanged ends "Teflon" impregnated packing, and two-piece backing bland assembly.
- G. Globe Valves, 2-Inch and Smaller: NSS SP-80; Class 125; body and screwed bonnet of ASTM B 62 cast bronze; with threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Provide Class 150 valves meeting the above where system pressure requires.
- H. Butterfly Valves, 2-1/2-Inch and Larger: MSS SP-67; rated at 200 psi; cast-iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide "Non-Leakage" full threaded lug flange body type capable of being broken down at one side of the valve remaining closed. Drill and tap valves on dead-end service or requiring additional body strength. At Contractor's option Victaulic 300 BFV for grooved piping systems may be used.
- I. Wafer Check Valves: Class 2500, cast-iron body; with replaceable bronze seat, and non-slam design lapped and balanced twin bronze flappers and stainless-steel trim and torsion spring. Provide valves designed to open and close at approximately one-foot differential pressure.
- J. Select Valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size 2 Inch and Smaller: Solder ends, except provide threaded ends for heating hot water.
 - 2. Steel Pipe Sizes, 2 Inch and Smaller: Threaded or grooved end.
 - 3. Steel Pipe Sizes, 2-1/2 Inch and Larger: Grooved end or flanged.

2.7 SHOCK ABSORBERS

- A. All water service to fixtures or groups of fixtures shall have concealed lead free ASSE 1010 compliant water hammer arrestors on both hot and cold-water branches. Locate shock absorbers close to fixture or at end of header.
- B. Shock arrestors shall be installed for sterilizer water supplies.

2.8 ESCUTCHEONS

- A. Provide escutcheons for all exposed lines passing through floors, walls, and ceilings. They shall be chrome plated brass and shall be of such flange size as to cover necessary penetrating openings.

2.9 FLASHING

- A. Flash all vent penetrations through roof. Extend flashing approximately 10 inches in all directions at base and turn ends down into top of pipe. Off-set vents where necessary to provide 4 feet minimum clearance from other flashing such as outside walls, curbs, etc. Note: All vents shall be 25 feet from fresh air intakes.

2.10 ACCESS PANELS

- A. Furnish and install access panels where valves, dampers, control boxes, etc. are concealed in walls, ceilings, floors, or otherwise inaccessible or where specifically called for on plans. Panels shall be Milcor Style DW, or Bar-Co. Model 500, J-L Industries Model WB, or equal sized as required and furnished with prime coat finish.

2.11 SYSTEM ACCESSORIES

- A. Automatic Drain Valves for Compressed Air Piping shall be corrosion-resistant metal body and internal parts, rated for 200 psig minimum working pressure, capable of automatic discharge of collected condensate. Plug End shall be flow-sensor bleeder, check-valve type, with serrated outlet for hose.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING:

- A. All pipe shall be true and straight, without sags or traps.
- B. The Contractor shall exercise care in cleaning joints after making cuts on pipe to prevent pipe particles from entering the system.
- C. All pipe fittings shall be same as piping specified unless indicated otherwise.
- D. Arrange, install piping approximately as indicated, straight, plumb and as direct as possible; form right angles, or parallel lines with building walls. The most practical appearance of piping runs is required. Keep pipes close to walls, partitions, ceilings; off-set only where necessary to follow walls as directed.
- E. Before installing piping, check plumbing drawings with architectural, mechanical, structural, electrical drawings; make accurate layout of plumbing and HVAC piping. Where interferences may appear and departures from indicated arrangements are required, consult with other trades involved; come to agreement as to changed locations and elevations of piping; obtain approval of proposed changes. Note runs of other contractor's piping and large conduits and cooperate to achieve neat appearance.
- F. Unless otherwise indicated, conceal all piping in building construction in finished areas. Install such piping in time so as not to cause delay to work of other trades and to allow ample time for tests and approval; do not cover before approval is obtained.
- G. Locate groups of pipes parallel to each other and building lines; space them at distance to permit access for servicing, valves, and to create most practical appearance when racked with conduits, refrigerant, etc., provided by other contractors.
- H. Keep fixture branches concealed to points above floor close to fixtures; expose only as much as necessary for final connection. Rigidly support pipes projecting from walls, chases, etc. in wall or chase to make firm, well-braced installation. Loosely supported pipe or accessory is not acceptable.

- I. Install horizontal piping to coordinate with other trades and install without sags or humps.
- J. Grade inside sewer piping at uniform slope of 1/4 inch per foot, minimum; where this is impossible, maintain slope as directed but in no case less than 1/8 inch per foot. Waste lines 3 inches and smaller must grade at minimum 1/4 inch per foot. See Drawings for fall on exterior sewer lines.
- K. Grade other piping as specified under heading or service where used, or as directed.
- L. Keep piping free from scale and dirt, protect open pipe ends wherever work is suspended during construction. To prevent foreign bodies entering and lodging in pipe, use temporary plugs or other approved material.
- M. Where changes in pipe sizes occur, do not bush down; use only reducing fittings. For drainage piping changes in direction, use long sweep bends where possible; otherwise, short sweep 1/4 bends or combination Y and 1/8 bends; also, Ys in combination with other bends.
- N. Provide shut off valves at all supply connections to all equipment. Supplier of equipment shall provide rough-in drawings and this contractor shall fully connect all items, supply necessary piping and fittings as required, unless otherwise noted individually.
- O. Buried thermoplastic piping systems shall be installed in accordance with ASTM D2321.
- P. Do not locate valves with stems below horizontal.
- Q. Locate valves for easy access and operations. Where concealed, notify General Contractor of exact location in order that he may leave openings for access panels. Provide access panels.
- R. Provide unions, screwed or flanged, where indicated, and in following locations even if not indicated.
- S. In connection to equipment requiring disconnection for repairs or replacement. Locate between shut-off and equipment.
- T. Approved expansion joints or flexible couplings shall be provided as necessary.
- U. Care shall be taken in making up pipe and fittings such that the pipe does not extend into fitting sufficiently to reduce the waterway.
- V. Standard, one-piece reducing fittings of approved design shall be used wherever a change in size is made. Changes in pipe sizes shall not be made by means of reducing flanges.
- W. Bushings may be used only where standard, one-piece reducing fittings are not available and shall be subject to the following:
 - 1. Bushings shall be of the face or flush type.
 - 2. Bushings shall not be used in elbow fittings.
 - 3. Bushings shall not be used when the reduction in size of the outlet is less than 1".
 - 4. Bushings shall not be used in more than one outlet of any tee or two outlets of any cross fitting.

3.2 INSTALLATION OF VALVES

- A. Use ball and butterfly valves for shut-off duty.

- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.
- D. Install three-valve bypass around each pressure reducing valve using throttling-type valves.
- E. Install valves in horizontal piping with stem at or above the center of the pipe.
- F. Install valves in a position to allow full stem movement.
- G. All valves, unions, etc. where pipe is chrome plated shall have similar finish. All exposed supplies to plumbing fixtures shall be chrome plated.
- H. All valves, on insulated piping shall be complete with extended lever handle stem.

3.3 PIPE MARKERS

- A. Provide pipe markers and directional arrows on all piping in mechanical equipment rooms, or which is exposed in building, and on both sides of all valves located above ceiling. Markers shall be as manufactured by W.H. Bradley Co., or the equivalent. All letters shall be color-coded and sized as recommended by OSHA. Samples of the type of letters to be used shall be submitted with shop drawings.
- B. The following pipe and valves shall be identified:

	Piping	Valves
1. Domestic Cold Water	X	X
2. Domestic Hot Water Supply	X	X
3. Domestic Hot Water Return	X	X
- C. Pipe markers with arrows shall indicate lines content and shall be located 20 feet on center and at each change of direction of line. Identification bands shall be color coded to match pipe markers and shall be provided 10 feet on center. Pipe identification markers shall be taped at each end and shall be taped around the entire circumference of pipe.

3.4 TEST

- A. Make such tests of work as specified, or required by Architect or by State and Municipal Bureaus having jurisdiction, and under their supervision. Perform tests in presence of Architect's representative. Notify Architect two days prior to testing.
- B. Provide apparatus, temporary piping connections, or other requirements necessary for tests. Take precautions to prevent damage to building or contents by tests. Contractor is required to repair and make good at his expense damage so caused.
- C. For Drain, Waste, and Vent piping, use hydrostatic test to 10 feet of head. Do not use compressed air or gas.
- D. Correct leaks, defects, or deficiencies discovered as result of tests. Repeat tests until test requirements are fully complied with. Caulking of pipe joints to remedy leaks is not permitted, except on lead and oakum joints.

3.5 STERILIZATION

- A. Sterilization 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 approval report to Architect.

END OF SECTION 22 05 19

SECTION 22 07 00 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Pipe insulation shall not begin until all work has been tested and found to be tight. All insulation adhesives, sealers, tapes and mastic shall meet the latest NFPA requirements and shall meet 25/50/50 flame spread and smoke developed ratings.
- B. All insulation shall be installed in strict accordance with the manufacturer's recommendations.
- C. All pipe insulation where recommended by the manufacturer shall be banded with aluminum bands, three to a section and with one band on each side of each fitting, valve, etc.
- D. Insulation shall be continuous through walls and ceilings.
- E. All valves, strainers, etc. shall be insulated to maintain the same thermal resistance rating as its adjacent piping and the covering shall extend all the way up to the equipment.
- F. Use high density insulation inserts at hangers on all piping 1-1/2" and above to prevent crushing of insulation.

PART 2 - PRODUCTS

2.1 THERMAL INSULATION

- A. After all work has been tested and approved, insulate as follows:
 - 1. Insulation shall be installed in accordance with the manufacturer's recommendations and instructions.

2.2 DOMESTIC WATER PIPING

- A. Cover all domestic cold and hot water lines and hot water return lines above slab with 1" thick, high density fiberglass insulation with Universal Fire-Retardant Jacket, Owens/Corning "25 ASJ/SSL", Knauf ASJ-SSL, or equal. All laps are to be sealed and stapled in place. Fittings are to be mitered segments of insulation held in place with white vapor barrier tape for concealed areas and Zeston 25/50 PVC, Knauf 25/50 rated PVC, pre-molded insulated fitting covers in exposed areas.
- B. Domestic cold and hot water lines 1-1/2" and above shall be insulated with 1-1/2" thick fiberglass with jacket.
- C. All water lines exposed, including mechanical rooms, shall be covered with 0.030 PVC jacket with solvent welded seams and joints.



- D. All water lines on the outside of the building exposed to the weather shall be covered with 0.016" smooth aluminum jacket and elbows.
- E. Domestic cold and hot water lines run below slab within building shall be insulated with 3/4" thick closed cell tube insulation. Apply two (2) coats of mastic on insulation.

2.3 WASTE LINE P-TRAPS

- A. P-traps receiving HVAC condensate (exposed to weather or above ceilings) shall be insulated with 2.33" thick 3/4 # density fiberglass duct wrap insulation with aluminum foil vapor barrier. Insulation shall be sealed at all seams and joints.

2.4 STORM DRAIN PIPING

- A. All storm drain piping shall be insulated with 2.33" thick 3/4 # density fiberglass duct wrap insulation with aluminum foil vapor barrier. Insulation shall be sealed at all seams and joints.

2.5 LAVATORY P-TRAP & SUPPLY LINES

- A. Unless specified otherwise on drawings, insulate p-trap, tailpiece and water supplies on lavatories/sinks with white, Truebro Model 102 Handi Lav-Guard, Pro-Wrap A.D.A. lavatory insulation kit, or approved equivalent insulating system to meet A.D.A. Requirements. Provide accessories for offset tailpiece as required.

PART 3 - EXECUTION

3.1 INSULATION THROUGH HANGERS AND SLEEVES

- A. The insulation shall be continuous through pipe hangers and pipe sleeves. At hangers where the pipe is supported by insulation, provide a galvanized iron protection shield. Provide pipes 2-inch i.p.s. and larger in insulation inserts at points of hanger supports. The inserts shall be of calcium silicate, cellular glass, prestressed molded glass fiber of minimum 13-pound density, or other approval material of the same thickness as adjacent insulation and not less than 13-pound density. The inserts shall have sufficient compression strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Inserts shall be 180 degrees and not less than the length of the protection shield. Vapor barrier facing of the insert shall be the same as the facing on the adjacent insulation. Where copper clad hangers are used on domestic copper pipe, insulation may cover pipe and hanger. Provide 18-gauge metal saddles between all hangers and insulation.

END OF SECTION 22 07 00



SECTION 22 13 19 – PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes plumbing specialties for water distribution systems; soil, waste, and vent systems; and storm drainage systems.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working pressure ratings, except where otherwise indicated:
 - 1. Water Distribution Systems, Below Ground: 250 psig.
 - 2. Water Distribution Systems, Above Ground: 250 psig.
 - 3. Soil, Waste, and Vent Systems: 10-foot head of water.
 - 4. Storm Drainage Systems: 10-foot head of water.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections, and Utility Company requirements.
- B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products that apply to this project scope:
 - 1. Drain valves.
 - 2. Trap seal primer valves.
 - 3. Cleanouts, cover plates, and access panels.
 - 4. Floor drains, open receptors, trench drains, and roof drains.
 - 5. Sleeve penetration systems.
- C. Maintenance data for inclusion in Operating and Maintenance manuals as specified in Division 01.

1.5 QUALITY ASSURANCE

- A. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- B. Electrical Component Standard: NFPA 70, "National Electrical Code."
- C. Listing and Labeling: Provide equipment that is listed and labeled.

- D. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
- E. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.6 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.
- B. Operating Keys (Handles): Furnish 1 extra key for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS PIPING SPECIALTIES

- A. Piping specialties such as escutcheons, dielectric fittings, sleeves, and sleeve seals are specified in Division 23 Section "Basic Mechanical Materials and Methods."
- B. Stop-and-Waste Drain Valves: Ball valve or MSS SP-80 gate valve, rated for 200 psig WOG minimum, ASTM B 62 bronze body, with 1/8-inch side drain outlet and cap.
- C. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
 - 1. 30-75 psig minimum operating pressure.
 - 2. Bronze body with atmospheric-vented drain chamber.
 - 3. Inlet and Outlet Connections: 1/2 inch threaded, union, or solder joint.
 - 4. Gravity Drain Outlet Connection: 1/2 inch threaded or solder joint.
 - 5. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- D. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for termination of roofing membrane, and with threaded or hub top for extension of vent pipe.

2.2 CLEANOUTS

- A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping.
- B. Cleanouts larger than 4 inches are not required except where indicated.
- C. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring.
- D. Covers of clean-outs shall be extra-heavy duty, AASHTO H20-44 or greater due to high wheel/point loads.
- E. Cleanout top styles shall be coordinated with floor types.

2.3 SLEEVE PENETRATION SYSTEMS

- A. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
 - 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on 1 end for installation in cast-in-place concrete slabs.
 - 2. Stack Fitting: ASTM A 48, cast-iron, hubless-pattern, wye branch stack fitting with neoprene O ring at base and cast-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.
 - a. Special Coating: Include corrosion-resistant interior coating on fittings for vent stacks.

2.4 FLASHING MATERIALS

- A. Elastic Membrane: Nonreinforced flexible, black elastic, sheet, 50 to 65 mils thick and complying with the following:
 - 1. Shore A Hardness: ASTM D 2240, 50 to 70.
 - 2. Tensile Strength: ASTM D 412, 1200 psi.
 - 3. Tear Resistance: ASTM D 624, Die C, 20 lb per linear inch.
 - 4. Ultimate Elongation: ASTM D 412, 250 percent.
 - 5. Low-Temperature Brittleness: ASTM D 746, minus 30 deg F.
 - 6. Resistance to Ozone Aging: ASTM D 1149, no cracks for 10 percent elongated sample for 100 hours in ozone at 104 deg F.
 - 7. Resistance to Heat Aging: ASTM D 573, maximum hardness increase of 15 points, elongation reduction of 40 percent, and tensile strength reduction of 30 percent, for 70 hours at 212 deg F.
 - 8. Fasteners: Metal compatible with material and substrate being fastened.

PART 3 - EXECUTION

3.1 PIPING SPECIALTY INSTALLATION

- A. Install strainers on supply side of each control valve, pressure-regulating valve, and solenoid valve, and where indicated.
- B. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1:100) (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.
- C. Install expansion joints on vertical risers, stacks, and conductors.
- D. Install cleanouts in above-ground piping and building drain piping where indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4 inches size. Use 4 inches size for larger drainage piping except where larger size cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping 3 inches and smaller and 80 feet for larger piping.
 - 4. Locate at base of each vertical soil or waste stack.
- E. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

- F. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- G. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.
- H. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer's written instructions.
- I. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

3.2 CONNECTIONS

- A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts to fixtures of sizes indicated, but not smaller than required by equipment/fixture connection size and/or required by the plumbing code.
- B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, for equipment/fixture connection size and/or required by the but not smaller than required by plumbing code.
- C. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.3 FLASHING INSTALLATION

- A. Provide flashing manufactured in a single piece except where large pans, sumps, or other drainage shapes are required.
- B. Install 4 psf lead flashing or 16 oz. per sq. ft. copper, except when another weight or material is specified.
- C. Install 6 psf lead flashing or heavier where burning (welding) of lead sheets is required.
- D. Solder joints of metal sheet flashing utilized sheets where required.
- E. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with membrane waterproofing.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum sleeve length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- F. Set flashing on floors and roofs in solid coating of bituminous cement.
- G. Secure flashing into sleeve and specialty clamping ring or device.
- H. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Division 07 Section "Sheetmetal Flashing and Trim."
- I. Extend flashing up vent pipe passing through roofs and turn down into pipe or secure flashing into cast-iron sleeve having calking recess.

- J. Fabricate and install metal sheet flashing and pans, sumps, and other drainage shapes consistent with Architectural details and materials identified. Install drain connection at all equipment requiring drain piping connection.

3.4 COMMISSIONING

- A. Preparation: Perform the following checks before start-up:
 - 1. Systems tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.
 - 3. There is clear space for servicing of specialties.
- B. Before operating systems, perform these steps:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open valves to full open position.
 - 3. Remove and clean strainers.
 - 4. Verify drainage and vent piping are clear of obstructions. Flush with water until clear.
- C. Starting Procedures: Follow manufacturer's written procedures.

3.5 ADJUSTING

- A. Adjust operation and correct deficiencies discovered during commissioning.

3.6 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 22 13 19



SECTION 22 14 00 – DRAINAGE AND VENT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section specifies building sanitary drainage and vent piping systems, building condensate drainage system, building grease waste drainage and vent system, and storm drainage and vent piping systems, including drains and drainage specialties.

1.3 DEFINITIONS

- A. Building Drain: That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer.
- B. Building Sewer: That part of the drainage system which extends from the end of the building drain and conveys its discharge to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.
- C. Drainage System: Includes all the piping within a public or private premise which conveys sewage, rain water or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.
- D. Vent System: A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and back pressure.

1.4 SUBMITTALS

- A. Refer to Division 01 and Division 23, Basic Mechanical Requirements for administrative and procedural requirements for submittals.
- B. Product Data: Submit product data for the following products that apply to this project scope:
 - 1. Drainage piping specialties
 - 2. Floor drains.
 - 3. Roof Drains
- C. Quality Control Submittals:
 - 1. Submit reports specified in Part 3 of this Section.

1.5 QUALITY ASSURANCE

- A. Codes and Standards:

1. Plumbing Code Compliance: Comply with applicable portions of Edition 2021 of the International Plumbing Code.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of roof drains, flashing, and roof penetrations.
- B. Coordinate flashing materials installation of roofing, waterproofing, and adjoining substrate work.
- C. Coordinate the installation of drains in poured-in-place concrete slabs, to include proper drain elevations, installation of flashing, and slope of slab to drains.
- D. Coordinate with installation of sanitary and storm sewer systems as necessary to interface building drains with drainage piping systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer Uniformity: conform with the requirements specified in Division 23, Basic Mechanical Requirements, under "Product Options" for the following drainage and vent systems.

2.2 DRAINAGE PIPING SPECIALTIES

- A. Backwater Valves: Valve assembly shall be bronze fitted cast-iron, with bolted cover. Flapper shall provide a maximum 1/4" clearance between flapper and seat for air circulation. Valve ends shall suit piping material.
- B. Trap Primers: Bronze body valve with automatic vacuum breaker, with 1/2" connections matching piping system. Complying with ASSE 1018.
- C. Expansion Joints: Cast-iron body with adjustable bronze sleeve, bronze bolts with wing nuts.
- D. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.
- E. Floor Cleanouts: Cast-iron body and frame, and adjustable round top as follows:
 1. Nickel-Bronze Top: Manufacturer's standard cast unit with the following patterns:
 2. Exposed flush type, standard non-slip scored or abrasive finish.
 3. Cast-iron Top: Manufacturer's extra-heavy duty cast unit with the following patterns:
 - a. Exposed flush type, standard non-slip scored or abrasive finish.
 4. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover including screws.
 5. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.
 6. Vent Flashing Sleeves: Cast-iron calking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast bronze stack flashing sleeve for copper tubing.
 7. Frost-Proof Vent Caps: Construct of galvanized iron, copper, or lead-coated copper, sized to provide 1" air space between outside of vent pipe and inside of flashing collar extension.
 8. Vandal-Proof Vent Caps: Cast-iron body full size of vent pipe, with calked base connection for cast-iron pipes, threaded base for steel pipes.

2.3 FLOOR DRAINS

- A. Floor drain type designations, descriptions, and sizes are indicated on Drawings.

2.4 ROOF DRAINS

- A. Roof Drain type designation, description and sizes are indicated on drawings.
- B. Roof Drains: Cast-iron body and combined flashing collar and gravel stop, cast-iron dome, shall have the following features (unless otherwise noted):
 - 1. Underdeck clamp
 - 2. 1-1/2" Extension
 - 3. Sump receiver
 - 4. Expansion Joint
 - 5. Deep sump body
 - 6. Vandal-proof dome
 - 7. Bottom outlet, inside caulk except side outlet where specifically shown on plans.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all dimensions by field measurements. Verify that all drainage and vent piping and specialties may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.
- B. Verify all existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.
- C. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation.
- D. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.
- E. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOUNDATION FOR UNDERGROUND BUILDING DRAINS

- A. Grade trench bottoms to provide a smooth, firm and stable foundation, free from rock, throughout the length of the pipe.
- B. Remove unstable, soft, and unsuitable materials the surface upon which pipes are to be laid and backfill with clean sand and pea gravel to indicate invert elevation.
- C. Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.3 JOINING PIPES AND FITTINGS

- A. Copper Tubing: Solder joints in accordance with the procedures specified in ANSI B9.1.

- B. Cast-Iron Soil Pipe: Make lead and oakum calked joints, compression joints, and hubless joints in accordance with the recommendations in the CISPI Cast Iron Soil Pipe and Fittings Handbook, Chapter IV.

3.4 INSTALLATION

- A. Refer to the separate Division 23 section: Basic Piping Materials and Methods, for general piping installation instructions.
- B. Install supports and anchors in accordance with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors".
- C. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into account many design considerations. So far as practical, install piping as indicated.
- D. Make changes in direction for drainage and vent piping using appropriate 45-degree wyes, half-wyes, or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn fittings where two fixtures are installed back-to-back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.
- E. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. 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. Maintain swab or drag in line and pull past each joint as it is completed.
- F. Install building drain pitched down at minimum slope of 1/4" per foot (2 percent) for piping 3" and smaller, and 1/8" per foot (1 percent) for piping 4" and larger.
- G. Extend building drain to connect to sewer piping, of size and in location indicated for service entrance to building. Sewer piping is specified in a separate section of Division 02.
- H. Install sleeve and mechanical sleeve seal through foundation wall for watertight installation.
- I. Install 1" thick extruded polystyrene over underground building drain piping not under building. Width of insulation shall extend minimum of 12" beyond each side of pipe. Install directly over and center on pipe center line.

3.5 INSTALLATION OF PIPING SPECIALTIES

- A. Install backwater valves in sanitary building drain piping as indicated, and as required by the plumbing code.
- B. Install expansion joints on vertical risers as indicated, and as required by the plumbing code.
- C. Above Ground Cleanouts: Install in above ground piping and building drain piping as indicated, and as required by plumbing code;

1. At each change in direction of piping greater than 45 degrees;
 2. At minimum intervals of 50' for piping 3" and smaller and 80' for larger piping;
 3. At base of each vertical soil or waste stack.
- D. Clean-outs Covers (extra heavy duty): Install floor and wall cleanout covers for concealed piping, types as indicated at all cleanouts.
- E. Flashing Flanges: Install flashing flange and clamping device with each stack and clean-out passing through waterproof membranes.
- F. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.
- G. Frost-Proof Vent Caps: Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1" clearance between vent and pipe and roof substrate.

3.6 INSTALLATION OF FLOOR DRAINS

- A. Install floor drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- C. Set drain elevation depressed below finished slab elevation as listed below to provide proper slope to drain:

DEPRESSION	RADIUS OF AREA DRAINED
1/2"	5'-0"
3/4"	10'-0"
1"	15'-0"
1-1/4"	20'-0"
1-1/2"	25'-0"

- D. Trap all drains connected to the sanitary sewer. Provide 6" deep seal p-traps, and trap primers.
- E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
- F. Position drains so that they are accessible and easy to maintain.

3.7 INSTALLATION OF TRAP PRIMERS

- A. Install trap primers with piping pitched towards drain trap, minimum of 1/8" per foot (1 percent). Adjust trap primer for proper flow.

3.8 INSTALLATION OF ROOF DRAINS

- A. Install roof drains at low points of roof areas, in accordance with the roof membrane manufacturer's installation instructions, and related Architectural instruction and/or details, that apply.
- B. Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.

- C. Position roof drains so that they are accessible and easy to maintain.

3.9 CONNECTIONS

- A. Piping Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated.
- B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.10 FIELD QUALITY CONTROL

A. Inspections:

1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the Architect.
2. During the progress of the installation, notify the Architect, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the Architect.
3. Rough-in Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
4. Final Inspection: Arrange for a final inspection by the Architect to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
5. Re-inspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for reinspected by the Architect.
6. Reports: Prepare inspection reports, signed by the Architect.

B. Piping System Test:

1. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
2. Leave uncovered and unconcealed all new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose all such work for testing, that has been covered or concealed before it has been tested and approved.

C. Drainage and Venting System Testing Procedures:

1. Rough Plumbing: Except for outside leaders and perforated or open jointed drain tile, test the piping of plumbing drainage and venting systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.
2. Finished Plumbing: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight. Plug the stack openings on the roof and building drain where it leaves the building, and introduce air into the system equal to a pressure of 1" water column. Use a "U" tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without the introduction of additional air throughout the period of inspection. Inspect all plumbing fixture connections for gas and water leaks.

3. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
4. Prepare reports for all tests and required corrective action.

3.11 ADJUSTING AND CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Clean drain strainers, domes, and traps. Remove dirt and debris.

3.12 PROTECTION

- A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION 22 14 00



SECTION 22 40 00 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.
- B. Products unloaded, uncreated, set in place, installed and final connections made but not furnished under this Section include:
 - 1. Plumbing Fixtures described in Plumbing Fixture Schedule.
 - 2. Accessories, appliances, appurtenances, and equipment specified in other sections, requiring plumbing services or fixture-related devices such as ice makers for refrigerators, as indicated.

1.3 DEFINITIONS

- A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.
- B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.
- C. Appliance: Device or machine designed and intended to perform a specific function.
- D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.
- E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.
- F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.
- G. Fixture: Installed receptor connected to the water distribution system that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "Fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.
- H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.

- I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
 - 1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.
 - 2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
 - 3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
 - 4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.
- J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of ANSI Standard A117.1, "Buildings and Facilities -- Providing Accessibility and Usability for Physically Handicapped People," and Public Law 90-480, "Architectural Barriers Act, 1968," with respect to plumbing fixtures for the physically handicapped.
- B. Regulatory Requirements: Comply with requirements of ATBCB (Architectural and Transportation Barriers Compliance Board) "Uniform Federal Accessibility Standards (UFAS) - 1985-494-187" with respect to plumbing fixtures for the physically handicapped.
- C. Listing and Labeling: Provide electrically (battery) operated fixtures specified in this Section that are listed and labeled.
 - 1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixtures is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

- B. Store plumbing fixtures on elevated platforms in a dry location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work as described in plumbing fixture schedule on drawings.

2.2 PLUMBING FIXTURES, GENERAL

- A. Contractor shall install all plumbing fixtures shown on accompanying Drawings. Refer to both Plumbing and Architectural, and install all fixtures shown on either.
- B. Provide plumbing fixtures and trim, fittings, other components, and supports as specified in "Plumbing Fixture Schedule" identified on plans.
- C. All brass must be of the best quality. Lightweight goods will not be accepted.
- D. All brass pipe shall be seamless brass tubing and nipples shall be extra heavy.
- E. All fittings and trim shall be chromium plated heavy brass unless otherwise specified.
- F. "P" traps on lavatories and sinks shall be cast brass with cleanouts.
- G. All exposed piping shall be chromium plated.
- H. Provide cut-off valves at each fixture in both hot and cold-water piping.
- I. For the purpose of establishing type and class of fixtures required, the following plate numbers have been taken from the Manufacturer's Catalog as indicated Fixture manufacturers and Model numbers with prior approval will be acceptable, however fixtures and accessories shall meet standards and features consistent with basis of design fixtures and accessories identified.
- J. Provide plumbing fixtures and trim, fittings, other components, and supports as specified in "Plumbing Fixture Schedule" identified on plans.

2.3 PLUMBING FIXTURE SUPPORTS

- A. Supports: ASME A112.6.1M, categories and types as required for specified wall-hanging fixtures, and wall reinforcement.
 - 1. Support categories are:
 - a. Carriers: Supports for wall-hanging fixtures supported from wall construction.
 - b. Reinforcement: 2 inches by 4 inches wood blocking between studs or 1/4 inch by 6 inches steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.
 - c. Support Types: Provide support of type having features required to match fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.
- B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
 - 1. Carriers for following fixtures:
 - a. Wall-hanging fixtures supported from wall construction.
 - 2. Chair carriers for the following fixtures:
 - a. Wall-hanging urinals.
 - b. Wall-hanging lavatories and sinks.
 - c. Wall-hanging drinking fountains and electric water coolers.
 - 3. Heavy-duty chair carriers for the following fixtures:
 - a. Fixtures where specified.
 - 4. Reinforcement for the following fixtures:
 - a. Floor-mounted sinks required to be secured to wall.
 - b. Recessed, box-mounted electric water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

- A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.
- B. Install water closets with closet flanges and gasket seals.
- C. Install wall-hanging, back-outlet urinals with gasket seals.
- D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
- E. Fasten wall-mounted fittings to reinforcement built into walls.
- F. Fasten counter-mounting-type plumbing fixtures to casework.
- G. Secure supplies behind wall or within wall pipe space, providing rigid installation.
- H. Install stop valve in an accessible location in each water supply to each fixture.
- I. Install trap on fixture outlet except for fixtures having integral trap.
- J. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.

- K. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant in accordance with sealing requirements specified in Division 07. Match sealant color to fixture color.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.
 - 2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.
- D. Replace washers of leaking and dripping faucets and stops.
- E. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
 - 1. Review the data in Operating and Maintenance Manuals. Refer to Division 01.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

END OF SECTION 22 40 00

SECTION 23 00 10 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL



1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the Contractor to assure himself that all items covered in the mechanical Division have been included if he chooses to accept separate bids.
- B. It is the intent of this specification that all materials with temperatures below ambient conditions or conveying any fluid/gas at temperatures below 70 deg. F be insulated to completely eliminate the potential for condensation. Unless specified elsewhere in these specifications, for materials that do not require and requiring occasional access, use 2" thick closed cell rubberized insulation with re-sealable fabric joints (hook and loop type).
- C. Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- D. It is the intention of these specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping devices, equipment, etc. necessary to provide a satisfactory installation that is complete and in good working order.
- E. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions which would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.
- F. Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.
- G. Provide as work of this Division (unless clearly and specifically indicated as a requirement of the Division 26 contractor on the Division 26 drawings) the following:
 - 1. 120V power to all temperature control panels, unit controllers, field devices, etc. as required.
 - 2. Wiring of any remote start/stop switches, occupancy sensors, manual or automatic motor speed control devices, motorized damper actuators controlling Division 23 equipment.

1.3 BIDDING REQUIREMENTS AND RESPONSIBILITIES

- A. Prime bidder is responsible for all work, of all trades and sub-contractors bidding this project. It is the prime bidder's responsibility, prior to submitting a bid to ensure that sub-contractors coordinate all aspects of the work between trades, sub-contractors, etc. to the fullest extent possible.
- B. Prime bidder shall ensure that all sub-contractors, suppliers, equipment vendors, etc., obtain all necessary and pertinent contract document information pertaining to their work prior to the submission of a bid.
- C. Bidders of all or any portions of this section or division are required to review all contract documents including but not limited to Architectural drawings, Structural drawings, Mechanical drawings, Plumbing drawings, Electrical drawings, and Fire Alarm drawing section to coordinate requirements and responsibilities with and through prime bidder.
- D. Bidders of all or any portions of this section or division, by furnishing a bid on a portion of the prime contract are indicating that they have received all contract documents and coordinated services provided under their portion of the work with the prime bidder; they are indicating that they have expressed any pertinent questions (which would result from a detailed, thorough review of the entire set of contract documents) to the prime bidder in accordance with Division 01 requirements, prior to bidding.
- E. All timely, pertinent, questions provided in writing prior to bids, in accordance with Division 01 requirements, will be clarified, defined, or otherwise explained in written addendum and / or addendums prior to bids, in accordance in Division 01 requirements.
- F. It is not the intention of these contract documents to leave any issue relating to coordination between trades or sub-contractors vaguely defined. The intention is to define all issues, coordination matters, equipment requirements, sizes, routing, etc. to the satisfaction of the prime bidder, prior to receipt of bids.
- G. Bidders of all or any portions of this section or division, by virtue of the submission of a bid to the prime bidder, are indicating that they have reviewed the entire set of contract documents with due diligence and regard for the Owner's desire for a comprehensive and complete bid proposal; that they have expressed all concerns or questions requiring clarification on matters of coordination between trades and/or sub-contractors; that they have expressed any such concerns or questions in writing in accordance with Division 01 requirements.
- H. Prime bidders, by submission of a comprehensive bid on the project are indicating that the subcontractors selected in their bid have complied with all Division 01 requirements, that they have indicated in writing, prior to bidding, all questions or concerns requiring clarification and/or explanation and have documented any and all specific exclusions involving work that would generally be considered to be work of their trade. The prime bidder shall coordinate all work so that anything excluded by the bidder of all or any portions of this section or division, have been addressed prior to bids in one of the following manners:
 - 1. The work has been confirmed, by the prime bidder, to be work of another trade or subcontractor (whose proposal is also being accepted).
 - a. Clarification of the matter has been made through the prime design professional via written addendum and is clearly and mutually understood by the prime bidder and the party raising the issue/question, or seeking clarification.
 - b. The work has been accepted as the responsibility of the Contractor directly.

1.4 POST-BID VALUE ENGINEERING (V/E):

- A. Value Engineering (V/E) defined: For purposes of Division 23 Specifications, in accordance with all Division 01 Requirements and all Terms and Conditions of proposed contract between Owner and Contractor, Value Engineering (V/E) shall be defined as a "post bid" process, whereby the apparent low bidder (having submitted a proposal in strict accordance with Project Contract Documents, that exceeds the Owner's available funds for construction [AFC] for this specified project offers proposed changes ("Value Engineering") to the work. This proposed value engineering may alter or adjust aforementioned contract document requirements in exchange for financial and/or other consideration (in response to a specific request by the Owner/Owner's Representative).
- B. Value Engineering may not be considered, prior to scheduled receipt and review of Bid Proposals by the Owner and an official written request from the Owner/Owner's Representative expressing the Owner's desire to consider value engineering items.
- C. While it may be in the project Owner's interest to consider the first cost money saving that may be generated via alternatives and options generated via participation in Value Engineering, Division 23 contractor shall realize that substantive offers of Value Engineering (V/E), if accepted by the Owner, constitute a design-build agreement (offer and acceptance) with the owner, and drastically change the design concept of the project, as developed by the Professional of Record identified on the Contract Documents.
- D. Should Contractor offer, and the owner accept value engineering options that alter aspects of the system design, equipment, performance and/or performance verification or monitoring of respective systems, Contractor shall provide duly licensed professional engineering consultants working on behalf of the Contractor (including sub-contractors and equipment vendors/manufacturers) to review, approve and take professional responsibility for performance and suitability of V/E hybrid systems, materials or operational changes related to respective V/E items. The Contractor's licensed professional engineering consultants and the Contractor assume any and all responsibility for the design and suitability in terms of performance, of hybrid systems installed, as Contractor's Professional of Record, absolving the original project Professional of Record (identified on the original Contract Documents, released for the original project Bid/Negotiation) from responsibility for the V/E hybrid systems portion of the work.
- E. Division 23 Contractor, via the offer and acceptance of value engineering items on the project agrees to provide professional engineering design services and take full and complete responsibility for the hybrid design. Further, the Contractor's (V/E Items) professional of record (either employees, or independent consultants to the Contractor) through the offer and acceptance of V/E items, agree to indemnify and hold harmless the project owner, the owner's original A/E team (Professional of Record on behalf of the owner for the original Contract Documents) their heirs and assigns in regard to the V/E changes and their impact on the Division 23 systems altered, affected or modified, in whole or in part. The Professional of Record shown on the original Contract Documents in regard to the systems altered, adjusted, revised, modified or otherwise affected by the value engineering items implemented, shall be absolved of design responsibility as a result of implementation of V/E items, and their original use of Engineering Seals used for original Contract Documents, shall not apply.

1.5 MATERIAL AND EQUIPMENT

- A. The term "provide" when used in the Contract Documents shall mean "furnish and install" and includes all items necessary for the proper execution and completion of the Work.

- B. Specific reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Architect expressed in writing is equal to that specified.
- C. Coordinate and properly relate all Work of this Division to building structure and work of all other trades.
- D. Visit premises and become thoroughly familiar with existing conditions; verify all dimensions in field. Advise Architect of any discrepancies prior to Bid Date in accordance with Division 00.
- E. Do not rough-in for any item or equipment furnished by others or noted "Not in Contract" (NIC), without first receiving rough-in information or determining rough-in requirements from physically examining the existing equipment, receiving specific cut sheet information from the Owner's representative, other trades and/or Architect. Rough-in services for "NIC" equipment as required, as the work progresses.
- F. Provide storage and protection for all equipment and materials in accordance with requirements of Division 00 and Division 01. Replace any equipment and materials damaged by improper handling, storage, or protection, at no additional cost to Owner.
- G. Keep premises clean in accordance with requirements of Division 00 and Division 01.

1.6 SUBSTITUTIONS

- A. Substitutions are allowed under La. R.S. 38:2291 and La R.S. 38:2292. Any requests for prior approval (as provided for under La. R.S. 38:2295) including any re-submitted data, shall be received by the Architect/Engineer a minimum of fourteen (14) working days prior to bid date. The Contractor shall recognize that it may be necessary to submit certain requests for prior approval sooner than the final date listed in the Instructions to Bidders, depending upon the complexity and completeness of the submittal. If, in the opinion of the Architect/Engineer, there is neither sufficient time available nor adequate descriptive data attached to the submittal, the submittal will not be considered. Except as otherwise specified, materials and equipment shall be new and bear the approval label of the Underwriters Laboratories, Inc. for the type of installation required.
- B. Basis of design of systems is based on specific equipment for performance, size, shape, color, construction material, etc... If the use of other manufacturer's equipment, even though approved by Architect, involves additional cost due to space requirements, foundation requirements, increased mechanical or electrical services, the cost of such extra work shall be borne by the contractor. Even though a manufacturer's name appears in the Contract Documents as having acceptable equipment, his equipment shall be classified as being a substitute to the equipment originally designed for and named in the Contract Documents. Substitute equipment, materials, etc., will not be allowed to deviate from basis of design requirements.
- C. All requests for prior approval shall identify where proposed material matches or exceeds the performance of the equipment specified. In addition, such submittal shall also clearly identify all deficiencies compared to specified product. Submittal of general cut sheets will be returned rejected.

1.7 DRAWINGS AND SPECIFICATIONS

- A. The specific intent of these Contract Documents is to provide the various systems, equipment, etc. to the Owner complete and in a thoroughly calibrated and functional condition.
- B. The Drawings shall not be construed as shop drawings. In the event of a possible interference with piping or equipment of another trade, items requiring set grade and elevations shall have precedence over other items. Should any major interference develop, immediately notify the Architect.
- C. In laying out Work, refer to Contract Documents at all times in order to avoid interference and undue delays in the progress of the Work.
- D. Furnish all plumbing fixtures (with required accessories) shown on either the plumbing drawings or the architectural drawings. Review Architectural casework elevations and identify fixtures indicated. Provide fixtures indicated. Rough-in for all fixtures as work progress. Verify plumbing fixtures required from review of Mechanical and Architectural drawings, prior to fixture shop drawing submittal.

1.8 CODES AND REGULATIONS

- A. Work shall be in full accord with the most stringent interpretation of the State Sanitary Code, local ordinances, building codes, and other applicable national, local, and state regulations.
- B. Equipment shall conform to requirements and recommendations of the National Bureau of Fire Underwriters and National Fire Protection Association (NFPA).
- C. Items provided under this Division shall comply with the American National Standards Institute (ANSI) "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People," ANSI A 117.1
- D. In the possible event of conflict between codes or regulations and Contract Documents, notify the Architect immediately. Codes and Standards represent minimum requirements. These specifications may exceed requirements in various codes and standards.

1.9 FEES, PERMITS, AND TAXES

- A. Obtain and pay for permits required for the Work of this Division. Pay fees in connection therewith, including necessary inspection fees.
- B. Pay any and all taxes levied for Work of this Division, including municipal and/or state sales tax where applicable.

1.10 MANUFACTURER'S DIRECTIONS

- A. Install and operate equipment and material in strict accord with manufacturer's installation and operating instructions. The manufacturer's instructions shall become part of the Contract Documents and shall supplement Drawings and Specifications.

1.11 SUBMITTAL DATA

- A. Submit shop drawings, project data, and samples in accordance with requirements of Division 01.

- B. Shop drawings shall consist of published ratings or capacity data, detailed construction drawings for fabricated items, wiring and control diagrams, performance curves, installation instructions, manufacturer's installation drawings, and other pertinent data. Submit drawings showing revisions to equipment layouts due to use of alternate or substitute equipment.
- C. Where approved manufacturers and suppliers of equipment, materials, etc. are unable to fully comply with Contract Document requirements, specifically call such deviations to attention of Architect on submittals. Type deviations on a separate sheet; underlined statements or notations on standard brochures, equipment fly sheets, etc. will not be accepted.
- D. Approval of submittals shall not relieve Contractor from furnishing required quantities and verifying dimensions. In addition, approval shall not waive original intent of Contract Documents.
- E. Failure to obtain written approval of equipment shall be considered sufficient grounds for rejection of said equipment regardless of the stage of completion of the project.

1.12 PROJECT RECORD DOCUMENTS

- A. Keep Project Record Documents in accordance with requirements of Division 00 and/or Division 01.
- B. During construction period, keep accurate records of installations made under this Division, paying particular attention to major interior and exterior underground and concealed piping, ductwork, etc.

1.13 EXCAVATING AND BACKFILLING

- A. Provide excavating and backfilling necessary for Work of this Division. Comply with provisions of Division 31, Earth Work, if applicable.
- B. Trenches shall be inspected by Code Authorities and/or Owner's Representative before and after piping is laid. Give Owner's Representative 24-hour notice for each inspection. If any trenches are filled without Owner's Representative inspection and as subsequently found to be deficient, the trenches shall be uncovered.
- C. Inspected, and then re-filled, if requested by Owner's Representative.
- D. Provide minimum 18 inches of cover or in compliance with local published frost line data (if greater than 18 inches) to finish grades or paving at water piping.
- E. For piping, provide bell holes at trench bottom to assure uniform bearing. Accurately grade trench bottoms by instrument before laying any pipe.
- F. Protect and maintain trenches in dry condition until piping has been inspected and approved. Immediately after approval, backfill trenches in tamped layers.
- G. Compact fill to satisfaction of Architect and/or Owner's Representative.

1.14 CUTTING AND PATCHING

- A. Comply with requirements of Division 00 and Division 01 regarding cutting and patching. Locate and timely install sleeves as required to minimize cutting and patching.

- B. Cutting, fitting, repairing, patching, and finishing of Work shall be done by craftsmen skilled in their respective trades. Where cutting is required, cut in such a manner as not to weaken structure, partitions, or floors. Holes required to be cut must be cut or drilled without breaking out around the holes. Where patching is necessary in finished areas of the building, the Architect will determine the extent of such patching and refinishing.
- C. Repairing Roadways and Walks: Coordinate all roadway work with authorities having jurisdiction. Cut and/or bore under roadways for connection of utilities as required. Coordinate work through Contractor. Where this Contract cuts or breaks roadways, or walks to lay the piping, he shall repair or replace these sections to match existing, unless specifically identified as the responsibility of others.

1.15 PAINTING

- A. Painting shall be provided under Division 09, unless specified otherwise. Leave exposed piping, materials, and equipment clean and free of rust, grease, dirt, etc. before and after painting.
- B. Factory finished equipment, fixtures, and materials which are marred, chipped, scratched, or otherwise unacceptable shall be repaired or replaced under this Division to Architect satisfaction, at no additional cost to Owner.
- C. Coordinate all painting requirements with prime bidder prior to bids.
- D. Paint all exposed piping inside and outside of building. Label all piping after painting in accordance with Section 230553. Utilize industry standard paint colors for respective system unless directed otherwise by Architect. Review proposed color scheme with Division 23 Requirements prior to ordering materials.

1.16 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment, and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.
- B. If the Contractor's office is in excess of a fifty (50) mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The name of the contractor appointed to provide emergency services shall be submitted to the Architect for his approval.

PART 2 - PRODUCTS

2.1 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Furnish manufacturers operating and maintenance instructions, parts lists and sources of supply for replacements in accordance with Division 01.
- B. Provide the following operations and maintenance data:
 - 1. Complete sets of final and correct shop drawings, maintenance and replacement parts manuals, and operating instructions, for equipment supplied.
 - 2. Bind each set within a common binder. Index and organize with a table of contents, to permit quick and convenient reference.

3. Provide a minimum of five (5) days of instruction in operation and maintenance of equipment to Owner's Representative maintenance force. Design a 2-week period, convenient to Owner's Representative, during which qualified personnel, including manufacturers' technicians and authorized factory trainers shall be available for Architect/Owner's Representative instruction.

2.2 RECORD DRAWINGS

- A. Provide "Record Drawings" in accordance with the Division 01, General Requirements, indicating in a neat and accurate manner a complete record of all revisions of the original design of the work.
 1. Include all changes and provide for an accurate record, on reproductions of the Contract drawings or on appropriate shop drawings, all deviations between the work shown and work installed.
- B. Submit for approval bound sets of the required drawings, manuals and operating instructions.

2.3 IDENTIFICATION MARKINGS

- A. General: Apply identification tags, markers, etc. after insulation and field painting are completed.

PART 3 - EXECUTION

3.1 COORDINATION AND LAYOUT

- A. Study Drawings and Specifications to ensure completeness of work required.
 1. Include supplementary items normal to manufacturers' requirements or standard accepted trade practices as necessary to complete work, though not specifically indicated or specified.
- B. Verify measurements and conditions in field before starting work.
- C. Examine materials to which work is to be applied and notify the Architect/Owner's Representative, in writing, of any conditions existing which are detrimental to proper and expeditious installation of work.
 1. Starting of work shall be construed as acceptance of conditions.
- D. Confer with other trades, install work to avoid interference with other trades, and possible necessary adjustments to conform to structural conditions and work of other trades.
- E. Coordinate and set inserts and locate openings in floors and walls in new construction.
 1. Locate pipes and ducts to avoid interference with other work shown on the drawings and as directed by the Architect/Owner's Representative.
 2. Keep all concealed pipes and ducts within the enclosing construction provided.
 3. Arrange exposed work neatly in parallel runs and parallel with walls or structure, with uniformly spaced hangers and supports, and within the spaces assigned for each kind of work.

- F. Make coordinated layouts showing concrete work required for housekeeping pads, equipment bases and inertia masses which are cast in place, including the location of anchors and dowels.
 - 1. Coordinate the scheduling and placing of the concrete to suit the mechanical work schedules.
 - 2. Concrete housekeeping pads are to cover the full area of each piece of equipment. Concrete bases are to be of dimension and heights to suit the equipment. The forming and placing of concrete shall be provided under this specification section.

3.2 MAINTENANCE OF EQUIPMENT AND SYSTEM PRIOR TO FINAL ACCEPTANCE

- A. Maintain all installed equipment and systems in accordance with the manufacturer's published instructions, until final acceptance by the Architect/Owner's Representative, and take such measures as necessary to ensure adequate protection of all equipment and materials during delivery, storage, installation, operating and shut-down conditions.
 - 1. This responsibility shall include all provisions required to meet the conditions incidental to the delays pending final test of systems and equipment.
 - 2. Maintain and periodically clean all equipment until final acceptance.
- B. After installation of systems has been completed, operate the system to determine the capability of the equipment and controls to conform to the requirements of the drawings and specifications prior to performance testing.

3.3 DAMAGED EQUIPMENT

- A. Any and all equipment, parts, components, etc., provided under this division which is damaged by the Contract or which is received in damaged condition during shipping, transit, handling, or during installation shall be replaced. Dented, or damaged non-structural equipment jackets or surface casings such as but not limited to water heater jackets, boiler jackets, chiller insulation jackets, etc., shall either be repaired or replaced at the option of the Owner's Representative. If repaired, the finished product shall match original equipment exactly.
- B. Any equipment which develops surface rust, either through improper storage, handling or installation, shall be refinished by grinding the affected area down to bare (white) metal, then prepared with a rust preventive primer and finished with the original manufacturer's touch-up paint to match existing color.

3.4 EQUIPMENT INSTALLATION

- A. Locate and set equipment anchor bolts, dowels and aligning devices for all equipment requiring them. Coordinate requirements of concrete work with Contractor and other trades.
 - 1. Level the equipment and grout solid between the equipment and the surface below. Grout to be premixed grout mixed in accordance with manufacturer's specifications.
- B. The field assembly, installation and alignment of equipment is to be done under field supervision provided by the manufacturer or with inspections, adjustments and approval by the manufacturer.

- C. Equipment startup.
 - 1. Contractor shall provide qualified start-up personnel, certified by equipment manufacturer, to inspect and approve equipment and to supervise the operating tests of the equipment. System commissioning shall be performed in accordance with ASHRAE standards.
- D. Equipment and system test operation.
 - 1. Note: Equipment and system test operation is separate and apart from additional requirements of training and demonstration. Refer to individual sections for requirements regarding training and demonstration. Notify the Owner's Representative in advance of beginning the equipment and system test operation. All equipment testing/demonstration shall be performed in the presence of the Architect/Owner's Representative. A minimum of seven (7) days notice is required before equipment and system testing.
 - 2. Each piece of equipment shall be operated in its system as long as required to provide proper functioning.
 - 3. Perform an operating test of each complete system for twenty-four hours continuous operation as a minimum, or as long as required to provide coordination and proper functioning of all related systems and controls.
 - 4. The operating criteria for each test shall be determined in advance with the Owner's Representative approval whenever seasonal conditions shall not produce a full design load on any equipment or system.
 - 5. Certify to the Owner's Representative that all equipment is functioning properly.
 - 6. Should the apparatus fail to meet the Contract requirements, adjust, repair or replace all defective or inoperative parts and again conduct the complete performance tests.

3.5 CLEANING AND ADJUSTING OF SYSTEMS

- A. Blow out, clean and flush each system of piping, ductwork and equipment to thoroughly clean the systems.
 - 1. Clean all materials and equipment, and leave in condition ready to operate and receive succeeding finishes where required.
 - 2. Adjust and align all equipment interconnected with couplings or belts.
 - a. Adjust valves of all types and operating equipment of all types to provide proper operation.
 - b. Remove and clean elements in all steam trap bodies.
 - c. Clean all strainers. Replace temporary construction screens with new permanent screens.
- B. Permanent equipment operated during construction shall not be abused or be used in service different from its design application.
 - 1. Temporary disposable filters shall be used during temporary operation.
 - 2. All expendable media, including belts used for temporary operation and similar expendable materials shall be replaced just prior to acceptance.
 - 3. Packing boxes of equipment operated during construction must be replaced just prior to system acceptance, using materials and methods specified by the supplying manufacturer.
- C. Equipment furnished with factory finishes where damaged shall be retouched and repainted to present a new appearance.

- D. Furnish and maintain protection for all of the work whether completed or in progress.
 - 1. Furnish and install coverings and enclosures as required.
- E. New and existing operating equipment and systems shall be clean and dust free inside and out.
 - 1. Concealed and unoccupied areas such as plenums, pipe and duct spaces and Equipment Rooms shall be free of rubbish and swept, vacuumed, or wiped clean at time of acceptance.

3.6 CONTRACTOR REQUESTED FIELD OBSERVATIONS

- A. During the course of, and at stages appropriate to the progress of construction, the Contractor may request field observations of the design professional. If the field observation is a request of and by the Contractor, the Contractor shall provide all necessary ladders, scaffolding, lifts, safety harnesses or other equipment in order for the Architect to safely and adequately perform the requested observations.
 - 1. Requests for observations shall be made a minimum of seven (7) days in advance of the requested date of observation.
 - 2. All equipment, ladders, lifts, safety nets, scaffolding, etc., shall be provided and in place for the use of the Architect.
 - 3. All equipment panel covers, electrical panels, or other equipment shall be opened by the Contractor for viewing by the Architect.
 - 4. The Contractor shall make available a mechanic or technician of that field in order to answer questions of the designer, make any and all adjustments and/or corrections and to assist the Architect.

3.7 TESTING AND BALANCING

- A. Refer to Specifications Section 230593.

3.8 PAINTING

- A. General painting is typically performed by the Division 09 Contractor. This Contract shall however, either perform specialized painting as called for below in the following conditions or he shall advise the Contractor of these requirements as follows:
 - 1. Thoroughly clean all surfaces, requiring prime painting, of rust, loose scale, oil and grease.
 - 2. Dry surfaces before painting.
 - 3. Do not paint controls, nameplates, labels or sprinklers.
- B. Paint all equipment unless otherwise specified not to be painted at the factory with one prime coat of rust prohibitive paint.
- C. Provide field painting as follows:
 - 1. All exposed iron work, including un-insulated ferrous piping and conduit system components, hangers, supports, equipment bases, and apparatus; prime coat with a red lead-free paint.
 - 2. Un-insulated duct work and casing exposed to view and exposed galvanized surfaces of conduit and piping and of equipment prime painted at the shop: Prime coat, zinc chromate for galvanized surfaces.
 - 3. Inside of all duct work where visible through registers and grilles: One coat of flat black paint.

3.9 CONNECTIONS TO EQUIPMENT

- A. Provide mechanical connections to equipment and fixtures requiring such connections which are supplied by Architect/Owner's Representative or under other divisions.
- B. Provide unions, nipples, adapters, valves, flexible connections, and other trim required for final connections for each such fixture or item of equipment, as required for complete operation, servicing, and maintenance.

3.10 WORKMANSHIP

- A. Perform all work in a practical, neat and workmanlike manner with mechanics skilled in work, and using the best practices of the trade involved.
- B. No work shall be concealed until it has been inspected and approved by the Architect/Owner's Representative.
- C. Workmanship or materials not meeting with requirements of the specifications and drawings and satisfaction of the Architect/Owner's Representative shall be rejected and immediately replaced in an acceptable manner, without additional cost to the Architect/Owner's Representative.

3.11 LUBRICATION

- A. All equipment furnished, installed, or connected under this division, shall be inspected for proper lubrication when connected and before operation of the equipment is begun, as recommended by the Manufacturer.
- B. The Contractor for the work of this division shall be held responsible for any damage to equipment that is operated without having been properly lubricated.

3.12 USE OF PREMISES AND CLEANING

- A. Remove and dispose of all waste materials and rubbish due to all construction operations under the Contract, except as otherwise noted, and keep the building free from rubbish and dirt caused by his and/or his Sub-Contractors' employees.
 - 1. During the entire progress of the work, rubbish removal shall be made frequently so as to prevent any potential safety or health hazard.
- B. Upon completion of the work, remove all protection, paint, putty, and other stains from all fixtures and glass and leave the premises thoroughly broom cleaned.

3.13 CUTTING, ALTERING AND PATCHING

- A. Provide all cutting, chasing, drilling, altering and rough patching required for the work of this division.
- B. Do all shoring, bracing, cutting, patching, piecing out, filling in, repairing and refinishing of all present work as made necessary by the alteration and the installation of new work.
- C. All holes and openings occurring in the existing floors after equipment, partitions, floors, steel work, conduits and pipes are removed or installed shall be closed up with materials similar to the adjacent work.

- D. The size and location of items requiring an opening, chase or other provisions to receive it shall be given by the trade requiring same in ample time to avoid undue cutting of any new work to be installed. These provisions shall not relieve the Contractor from keeping other trades informed as to the required opening, chases, etc., nor from responsibility for the correctness thereof, nor for cutting and repairing after the new work is in place.
- E. Include all cutting, repairing, and patching in connection with the work that may be required to make the several parts come together properly and fit it to receive or be received by the work of other trades, as shown on the drawings and/or specified, or reasonably implied by the drawings and specifications.
- F. All repairing, patching, piecing-out, filling-in, restoring and refinishing shall be neatly done by mechanics skilled in their trade to leave same in condition satisfactory to the Architect/Owner's Representative.
- G. Materials and their methods of application for patching shall comply with applicable requirements of the specifications.
 - 1. Materials and workmanship not covered by the specifications and items of work exposed to view adjoining existing work to remain shall conform to similar materials and workmanship existing in or adjacent to the spaces to be altered.
- H. Cutting, repairing, and patching shall include all items shown on the drawings, specified in the specifications or required by the installation of new work or the removal of existing work.
- I. Remove partitions, walls, suspended ceilings, etc., as necessary to perform the required alterations or new construction work.
 - 1. Avoid damage to construction and finishes that are to remain.
- J. Protect and be responsible for the existing building, facilities and improvements if any.
 - 1. Any disturbance or damage to the work, the existing building, and improvements, or any impairments of facilities resulting from the construction operations, shall be promptly rectified, with the disturbed, damaged, or impaired work, restored, repaired or replaced at no extra cost.
- K. All alterations which are not indicated on the drawings nor specified herein but necessary to make good existing work disturbed by reason of the work shall be restored to a condition satisfactory to the Architect/Owner's Representative.
- L. All holes in masonry floors and walls are to be core drilled.
- M. Disturbed concrete and /or cement floor areas shall be patched with approved type latex mortar.
 - 1. When cement mortar is used for patching, the surfaces shall be depressed a minimum depth of one inch (1").
- N. Reinstall all weather protection work in waterproof manner.
- O. Openings in roofs:
 - 1. Openings in roofs shall be kept properly plugged and caulked at all times, except when being worked on, to preclude the possibility of flooding due to storms or other causes. After completion of work, openings shall be permanently sealed.

P. Temporary openings.

1. All temporary openings cut in walls, floors or ceilings for pipe or duct work shall be closed off with transite or an equally non-combustible material except when mechanics are actually working at the particular opening.

3.14 USE OF PERMANENT SYSTEMS:

A. Heating System:

1. The Contractor may, at his option, utilize the permanent heating systems provided under this Contract to provide space heating prior to Project completion date. The fuel for such space heating and for required tests of heating equipment shall be provided by Contractor.
2. The heating system shall be operated only by qualified personnel, and shall be operated with all auxiliaries, and in accordance with manufacturer's instructions and good operating practice. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, Contractor may be directed to disconnect its use.
3. Heating systems shall be operated and controlled to prevent temperature in any room or space in any building from exceeding 90 deg. F.
4. Systems may be activated without diffusers and registers in place, but filters with same efficiency as those specified shall be provided both in air handling equipment and at return air grille locations. Filter return air entering duct work, to prevent return air duct work from accumulating dust or otherwise becoming dirty.
5. Contractor shall, prior to final acceptance of the Work, place heating systems and related equipment in a condition equal to new.

B. Air Conditioning System:

1. The Contractor may, at his option, utilize the permanent air conditioning systems provided under this Contract to provide space cooling prior to the Project completion date.
2. The fuel, electricity or other energy required for space cooling and for any subsequent operation or testing shall be provided for by the Contractor.
3. The cooling system shall be operated only by fully qualified personnel and shall be operated with all auxiliaries, and in accordance with manufacturer's instructions and good operating practice. Start up of equipment for use by the Contractor shall not commence any warranty period.
4. Cooling systems shall be operated and controlled to prevent temperature in any room or space in any building from falling below 70 deg. F.
5. Systems may be activated without diffusers and registers in place, but filters with same efficiency as those specified shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air duct work from accumulating dust or otherwise becoming dirty.
6. Contractor shall, prior to final acceptance of the Work, place cooling systems and related equipment in a condition equal to new.

3.15 PENETRATIONS THROUGH FIRE SEPARATIONS

- A. Pack annular space between sleeve and pipe (insulation) and / or conduit in fire rated construction with fire retardant putty, sealant and / or caulk in accordance with listed assemblies utilized on the project. Material shall be non-asbestos based and installed in accordance with manufacturers instructions for fire rating required.

- B. Penetrations of multiple items and penetrations with annular space greater than 1/2" shall be provided with approved backing material in accordance with manufacturer's instructions.
- C. Fire retardant sealer and system shall meet ASTM E-84, ASTM E-814, and UL-1479.

END OF SECTION 23 00 10



SECTION 23 00 20 – BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 23. It expands and supplements the requirements specified in sections of Division 01.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Verify exact location and placement of all access panels with/through Architect prior to any equipment rough-in.
- B. Extend all grease fittings to an accessible location.
- C. Refer to the Division 08 Section: Access Doors.

1.4 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 23 for rough-in requirements.

1.5 MECHANICAL INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

- G. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- H. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.
- J. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.6 MECHANICAL COORDINATION DRAWINGS

- A. Prepare and submit a set of coordination drawings showing major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing and maintaining insulation, servicing, and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.
- B. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Mechanical equipment room layouts;
 - 2. Specific equipment installations, including:
 - a. Ductwork and diffusers;
 - b. Pumps (new and existing) and piping connections
 - c. Air Handling equipment, fan coils and terminal units with accessories requirements.
 - 3. Work in pipe spaces, chases, trenches, and tunnels;
 - 4. Exterior wall penetrations;
 - 5. Ceiling plenums which contain piping, ductwork, or equipment in congested arrangement;
 - 6. Installations in mechanical riser shafts, at typical sections and crucial offsets and junctures;
 - 7. Division 23 Contractor shall furnish drawings, to Contractor, once approved by reviewing Architect, to fully coordinate with all trades and subcontractors required. Failure to fully coordinate via this process shall not relieve the contractor of his responsibility to coordinate structural supports, electrical service routing of mechanical systems and provisions for required access.

1.7 CUTTING PATCHING AND SEALING OF PENETRATIONS

- A. This Article specifies the cutting and patching of mechanical equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.
- B. Refer to the Division 01 Section: CUTTING AND PATCHING for general requirements for cutting and patching.

- C. Refer to Division 26 Section for BASIC ELECTRICAL REQUIREMENTS for requirements for cutting and patching electrical equipment, components, and materials.
- D. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- E. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.
- F. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- G. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
 - 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.
- H. Cut, remove, and legally dispose of selected mechanical equipment, components, and materials as indicated, including, but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.
- I. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- J. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- K. Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.
- L. Seal all penetrations of building envelope air and watertight. For complete closure of openings, where necessary, provide 1/8" thick elastomeric barrier anchored to materials penetrating building envelope and adjacent envelope surfaces involved - seal connections with caulk and mechanical fasteners. Refer to Architectural Sections on joints and sealants. Seal all conduit systems communicating between conditioned and unconditioned spaces. Coordinate all work with and through prime bidder and other trades. Unless otherwise directed, caulk sealant shall be long lasting polyurethane based products, resistant to UV exposure, installed in accordance with manufactures instructions. Sealant joints shall withstand building pressures variance with respect to ambient of 0.25 inches water gauge, with no leakage in terms of air and or water vapor.

1.8 MECHANICAL SUBMITTALS

- A. Refer to the Conditions of the Contract (General and Supplementary) and Division 01 Section: Submittal Procedures for submittal definitions, requirements, and procedures.

- B. Submittal of bound shop drawings, product data, and samples will be accepted only when submitted by the Contractor. Data submitted from subcontractors and material suppliers directly to the Architect will not be processed.

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Instructions to Bidders for requirements in selecting products and requesting substitutions.

2.2 PRODUCT LISTING

- A. Prepare listing of major mechanical equipment and materials for the project. A sample schedule is included at the end of this Section to complete this requirement.
- B. Provide all information requested.
- C. Submit this listing as a part of the submittal requirement specified in the Division 01.
- D. When two or more items of same material or equipment are required (plumbing fixtures, pumps, valves, air conditioning units, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated.
- E. Provide products which are compatible within systems and other connected items.

2.3 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance, and similar essential data. Locate nameplates in an accessible location.

2.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.
- C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

2.5 RECORD DOCUMENTS

- A. Refer to the Division 01 Section: Closeout Procedures for requirements. The following paragraphs supplement the requirements of Division 01.

- B. Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C. Mark Specifications to indicate approved substitutions, Change Orders, actual equipment and materials used.

2.6 OPERATION AND MAINTENANCE DATA

- A. Refer to the Division 01 Section for Project Closeout or Operation and Maintenance Data for procedures and requirements for preparation and submittal of maintenance manuals.
- B. In addition to the information required by Division 01 for Maintenance Data, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.
- C. Submit in accordance with Section 017800.
- D. Use multiple binders if a single binder would exceed 2-1/2 inches in thickness; arrange the data in the same sequence as the specification sections; delete or mark through extraneous data.
- E. Provide tab pages with metal or plastic reinforced holes to separate each major item or closely related group of items with typed item names on the tabs. Supply a table of contents at the beginning of each volume listing at items, the manufacturers and the name, address and phone number of the nearest authorized service representative.
- F. A copy of the completed manual shall be submitted to the Contracting Officer one week before the user instruction for perusal. This copy will be returned to the Contractor with the user, comments. These comments shall be incorporated in the final copies of the manual. The Contractor shall obtain a signed receipt for the manual.
- G. The O & M Manual outline shall be prepared in two parts along the lines suggested in the 2019 HVAC Applications, Chapter 40.
- H. All contents shall be project specific, typewritten.

2.7 WARRANTIES

- A. Refer to individual equipment specifications for warranty requirements.

- B. Compile and assemble the warranties specified in Division 23, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

2.8 CLEANING

- A. Refer to the Division 01 Section for general requirements for final cleaning.
- B. Refer to Division 230593 Section: TESTING, ADJUSTING, AND BALANCING for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

PART 3 - EXECUTION

3.1 WARRANTIES

- A. Refer to the Division 01 Section for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.
- B. Compile and assemble the warranties specified in Division 23, into a separated set of vinyl covered, three ring binders, tabulated, and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

3.3 CLEANING

- A. Refer to the Division 01 Section for general requirements for final cleaning.
- B. Refer to Division 23 Section: TESTING, ADJUSTING, AND BALANCING for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

END OF SECTION 23 00 20

SECTION 23 05 10 - ELECTRICAL REQUIREMENTS FOR
MECHANICAL EQUIPMENT



PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

A. Compliance with National Electric Code Requirements

1. Minimum Requirements:

- a. The requirements of this Division supercede the "minimum" requirements of National Codes such as NEC in many areas. Where reference to this National Code is made, it is understood that the requirements of these codes are meant to indicate the "minimum" requirements required by these Contract Documents and are not to infer that these "minimum" requirements eliminate or in any way diminish the requirements of individual sections of these Contract Documents.
- b. Wherever compliance with this National Code is required, it shall be taken as a minimum requirement and applicable whenever the Contract Documents are silent with respect to specific requirements or installation procedures. The Contractor shall as a minimum, comply with the more stringent of the requirements.

B. Interlock Wiring for Mechanical Equipment

- 1. Interlocks & Wiring of Mechanical Equipment: It is the intent of the contract documents to note or include most of the obvious physical wiring, conduit, relays, and necessary interlocks between various pieces of mechanical/electrical equipment. Plans, details, specifications and drawings, however, do not typically indicate the exact extent and encompassment of all required mechanical/electrical interlocks, routing, control voltages, conduit, wiring diagrams, etc., between mechanical and electrical devices and equipment that may be required for the proper operation and sequencing of equipment. Also, typically not indicated on the drawings is the differentiation between field installed and factory provided wiring because of the significant differences in requirements between various equipment manufacturer's requirements and/or job site conditions. It is the responsibility of this contractor to first verify that all mechanical related items affecting other trades are properly coordinated, accounted for and included in pricing prior to bid date. Additional costs for interlocks after bids are received will not be allowed for failure to coordinate. Reference is made to coordination and responsibility of providing the required wiring diagrams and requirements between the various subs, etc. It remains however, the responsibility of this Contractor as further described in the following articles, to properly coordinate, be responsible for, and to allow for any and all costs associated with the requirements of the equipment manufacturer's recommendations in order to preserve guarantees and warranties. (Note: For informational purposes only) - Typical mechanical/electrical/control/wiring interlocks covered under this section include but are not limited to the following examples:

- a. Domestic water pump interlocks with aquastats & thermostats.
- b. Exhaust fans and supply fan general ventilation interlocks.
- c. Smoke detector interlocks with supply air fans.
- d. Hi-Limit Temperature (firestat) interlocks with supply air fans.
- e. Lo-Limit Temperature (freezestat) interlocks with supply air fans.
- f. Interlocks between automatic safety float switches in emergency drain pans and respective fan motors and/or condensing units.
- g. Interlocks between Air Handling Unit "Kill" switches and fan motor starters.
- h. Damper interlocks between required fire suppression systems.
- i. Fresh air damper interlocks with supply air fans.
- j. Two speed fan motors, number of conductors, and interlocks between motor starters and fan speed controllers.
- k. High limit temperature interlocks with unit heater thermostats.
- l. High and low water level limit interlocks with sump and ejector pumps.
- m. All other factory wired mechanical equipment requiring field installed connections and interfaces.

1.3 SUMMARY OF RESPONSIBILITY

- A. In order to ensure proper operation of mechanical equipment installed, it is the intent of this section of the specifications to ensure that the Division 23 Contractor is the ultimate party responsible for the proper electrical installation of the equipment provided under the technical specifications of this Division. Unless the Division 23 Contractor is fully licensed and qualified to provide a complete electrical installation, he shall obtain the services of a fully qualified electrical Contractor to perform those services required to provide a complete and operational system. If, however, the services of other Contractors or sub-contractors are required by the Division 23 Contractor in order that the equipment provided is to operate and perform as specified, the Division 23 Contractor shall obtain, pay for, and coordinate the services of such Contractor(s) in order to provide a complete a fully operational mechanical system. The Division 23 Contractor shall be fully responsible for the work of all sub-contractors and shall fully warrant their work in accordance with the requirements of Division 01 of these specifications.
- B. This section includes the basic requirements for field installed electrical conduits, power circuits, breakers, wiring, interlocks, and other electrical components which are to become an integral part of mechanical equipment provided under Division 23. All work performed under this section shall fully as a minimum, comply with Division 26 Specifications and National Electric Code - (latest edition) and shall be provided as listed below:
 - 1. All "field-installed" interlock and/or control/power wiring necessary to provide a complete and operating mechanical system shall be ultimately provided by, and be the responsibility of the Division 23 Contractor. These components shall include, but are not limited to the following examples:
 - a. Automatic Temperature Control panels
 - b. Installation and connection of factory installed motors
 - c. Variable frequency drives
 - d. Motors (single & multi-speed)
 - e. Motor starters (single and multi-speed) for all Division 23 equipment
 - f. Fire protection control panels
 - g. Supply, return, & exhaust fan interlocks
 - h. Plumbing fixture automatic flush valves
 - i. Interlocks between domestic water circulating pumps & aquastats
 - j. Exhaust fan/supply fan interlocks
 - k. Filters at AHUs

- l. AHU, hi-limit temperature interlocks, lo-limit temperature interlocks, smoke detectors, and other interlocks related to Life Safety protection.
 - m. Other various interlocks between items of mechanical equipment, safeties, and field wired interconnections.
- C. It is the responsibility of the Division 23 Contractor to fully coordinate the electrical requirements of his mechanical equipment with the Division 26 Contractor prior to bidding and to ensure that other contractors and divisions are made aware of the requirements of his equipment that he intends to provide. The Division 23 Contractor shall provide wiring and control diagrams of all mechanical, air conditioning, ventilation, plumbing and /or fire protection equipment clearly delineating between factory wiring and field installed wiring. The mechanical contractor shall ensure that all field installed wiring, interlocks, etc., required to provide a complete and operable system are inclusive with his bid.
- D. Specific electrical power requirements (i.e., horsepower and electrical characteristics) where known, for mechanical equipment are scheduled on the Drawings or within the body of the individual technical specifications.
- E. Low Voltage Wiring: Low voltage wiring is not typically shown on the contract documents or plans. It remains however, the responsibility of the Division 23 Contractor to fully coordinate the low voltage electrical requirements of his mechanical equipment with the Division 26 Contractor prior to bidding and to ensure that other Contractors and Divisions are made aware of the requirements of his equipment that he intends to provide. The Division 23 Contractor shall also provide the low voltage wiring and control wiring diagrams of all mechanical, air conditioning, ventilation, plumbing and /or fire protection equipment clearly delineating between factory wiring and field installed wiring.
 - 1. The Division 23 Contractor shall coordinate with the Division 26 Contractor for all necessary power requirements.

1.4 REFERENCES

- A. NEMA Standards MG 1: Motors and Generators
- B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.
- C. NEMA Standard 250: Enclosures for Electrical Equipment.
- D. NEMA Standard KS 1: Enclosed Switches.
- E. As a minimum, comply with National Electrical Code (NFPA 70).

1.5 SUBMITTALS

- A. Motors, Starters, & VFD Drives: Provide manufacturer's product data. If starters are an integral part of packaged mechanical equipment, then a separate starter submittal is not required.
- B. Submit product data for motors, starters, variable frequency drives and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.6 QUALITY ASSURANCE

- A. All electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.1 MOTORS

- A. The following are basic requirements for simple or common motors. For special duty motors, more detailed and specific requirements are specified in Section 230513 – "Electric Motors".
1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
 2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
 3. Temperature Rating: Rated for 50 deg. C environment with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).
 4. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
 5. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
 6. Motor construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
 - a. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
 - b. Bearings: Ball or roller or pillow block bearings with inner and outer shaft seals; re-greaseable, except permanently sealed where motor is normally inaccessible for regular maintenance; designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor; for fractional horsepower, light duty motors, sleeve type bearings are permitted.
 7. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation; totally enclosed, fan cooled for exterior applications or where specifically indicated on drawings.
 8. Overload protection: Built-in thermal overload protection.
 9. Noise rating: "Quiet"
 10. Efficiency: "Premium Energy Efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors", in accordance with IEEE Standard 112, test method B.
 11. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

2.2 STARTERS, ELECTRICAL DEVICES, AND WIRING

- A. Motor Starter Characteristics:
1. Enclosures: Unless otherwise specifically identified, provide NEMA 1, general purpose enclosures with padlock ears, except in wet or exterior locations, where enclosures shall be NEMA 3R with conduit hubs, or units in hazardous or dust laden atmospheres or other locations which shall have NEC rating for that particular proper class and division.
 2. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.
- B. Magnetic Starters:
1. Refer to Section 230514 - "Motor Starters" for full requirements of motor starters.
 2. As a minimum, provide the following items on each motor starter:
 - a. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
 - b. Trip-free thermal overload relays, each phase.

- c. Interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division 23- "Building Automation System" controls sections.
- d. Built-in 120 volts control circuit transformer, fused from line side, where incoming electrical service exceeds 240 volts.
- e. Lockable "Off" position handle.
- f. H-O-A selector switch.
- g. Externally operated manual reset.
- h. Under-voltage release or protection.

C. Motor connections:

- 1. Flexible conduit, weatherproof type where installed in damp or wet locations as defined by the NEC, except where plug-in electrical cords are specifically indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify equipment physical size and clearances required.
- B. Verify electrical interlocks required.

3.2 THERMAL STOPS & BARRIERS

- A. Thermal Barriers: Where electrical equipment, conduit, wiring, etc., penetrates or comes into contact with cold or hot mechanical equipment, provide thermal barriers to prevent intrusion of unconditioned air into mechanical equipment or to prevent electrical devices from sweating or accumulating condensation.
 - 1. Examples: Examples of the above include but are not limited to:
 - a. Air handling conduit penetrations at or into AHU casings.
 - b. Smoke detectors attachment to hot or cold ductwork.

3.3 TRAINING & DEMONSTRATION

- A. Provide training as described in individual technical specifications.

END SECTION 23 05 10



SECTION 23 05 13 – ELECTRIC MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes basic requirements for all motors connected to mechanical equipment. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

1.3 QUALITY ASSURANCE

- A. As a minimum, comply with applicable local, state and federal codes.
- B. As a minimum, comply with applicable requirements of recognized industry associations which promulgate standards for the various trades. (See individual Sections of Division 23).
- C. Employ only qualified personnel for this work. Employ competent, qualified mechanics to supervise the work.
- D. As a minimum, comply with ASHRAE Standard 90.1 - 1999 (or latest edition) for motors.
- E. As a minimum, comply with NFPA 70, "National Electrical Code." (Latest Edition)
- F. NRTL Listing: Provide NRTL listed motors.
- G. Term "Listed": As defined in "National Electrical Code," Article 100.
- H. Listing Agency Qualifications: "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- I. As a minimum, comply with NEMA Standard MG 1, "Motors and Generators."
- J. As a minimum, comply with UL 1004, "Motors, Electric."

PART 2 - PRODUCTS

2.1 MOTORS, GENERAL

- A. General: Requirements below apply to motors covered by this Section except as otherwise indicated, for motors classified as simple or common motors (Section 230510).
 - 1. Motors 1.0 HP and Larger: Polyphase.
 - 2. Motors Smaller Than 1.0 HP: Single-phase.
 - 3. Frequency Rating: 60 Hz
 - 4. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):

- a. 120 V Circuit: 115 V - motor rating.
- b. 208 V Circuit: 200 V - motor rating.
- c. 240 V Circuit: 230 V - motor rating.
- d. 480 V Circuit: 460 V - motor rating.
- 5. Service factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10 percent of motor voltage rating.
- 6. Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.
- 7. Temperature Rise: Based on 40 deg. C ambient except 50 deg. C when otherwise indicated in equipment specifications or on equipment schedules on Plans.
- 8. Enclosure: Open drip proof except where exposed to elements, weather, or where specifically called for on Drawings and/or equipment specifications.

B. Manufacturers

- 1. Acceptable Manufacturers: Subject to the following requirements, provide motors from one of the following manufacturers:
 - a. Baldor
 - b. Marathon
 - c. U.S. Motors
 - d. General Electric
 - e. Reliance

2.2 POLYPHASE MOTORS

A. General: Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated in equipment specifications.

- 1. NEMA Design Letter Designation: "B" with 1.15 Service Factor.
- 2. Multi-Speed Motors: Separate winding for each speed.
- 3. Energy Efficient Motors: Premium Efficiency.
- 4. Motors shall be complete with shaft grounding rings.

B. Variable Speed Motors for Use with Solid-State Drives:

- 1. NEMA Standard MG 1, Part 31, "Definite Purpose Inverter Fed Motors", continuous duty, Design B, squirrel-cage induction units with ratings, characteristics, and features coordinated with and approved by the drive manufacturer. The motor shall include 1600-volt slot and phase paper insulation for protection against damage due to reflected waves.
- 2. Internal Thermal Overload Protection for Motors: Protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.
- 3. Bearings: Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading of the application.

2.3 SINGLE-PHASE MOTORS

A. General: Conform to the following requirements except as otherwise indicated.

- B. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application.
 - 1. Permanent Split Capacitor.
 - 2. Split-Phase Start, Capacitor-Run.
 - 3. Capacitor-Start, Capacitor-Run.
- C. Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.
- D. Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.
- E. Bearings, belt connected motors, and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, pre-lubricated sleeve bearings may be used for other single-phase motors.

2.4 MOTOR EFFICIENCIES

- A. Premium Efficiency Motors:
 - 1. All motors shall bear the NEMA "Premium" label and shall meet or exceed the following nominal energy efficiency levels prescribed below for Design A or B continuous rated:

(The remainder of this page intentionally left blank)

Table 1 Nominal Efficiencies For “NEMA Premium” Induction Motors
Rated 600 Volts or Less (Random Wound)

2.5	Open Drip Proof			Totally Enclosed Fan Cooled		
HP	6-Pole	4-Pole	2-Pole	6-Pole	4-Pole	2-Pole
1	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2
15	91.7	93.0	90.2	91.7	92.4	91.0
20	92.4	93.0	91.0	91.7	93.0	91.0
25	93.0	93.6	91.7	93.0	93.6	91.7
30	93.6	94.1	91.7	93.0	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93.0	94.1	94.5	93.0
60	94.5	95.0	93.6	94.5	95.0	93.6
75	94.5	95.0	93.6	94.5	95.4	93.6
100	95.0	95.4	93.6	95.0	95.4	94.1
125	95.0	95.4	94.1	95.0	95.4	95.0
150	95.4	95.8	94.1	95.8	95.8	95.0
200	95.4	95.8	95.0	95.8	96.2	95.4
250	95.4	95.8	95.0	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	96.2	96.2	95.8	95.8	96.2	95.8
500	96.2	96.2	95.8	95.8	96.2	95.8

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: The following requirements apply to field-installed motors.
- B. Install motors in accordance with manufacturer's published instructions and the following:
 - 1. Direct Connected Motors: Mount securely in accurate alignment.
 - 2. Belt Drive Motors: Use adjustable motor mounting bases. Align pulleys and install belts. Use belts identified by the manufacturer and tension belts in accordance with manufacturer recommendations.

3.2 COMMISSIONING

- A. Check operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with the commissioning of the equipment for which the motor is a part.
- B. Report unusual conditions.
- C. Correct deficiencies of field-installed units.

3.3 TRAINING AND DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 - 1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 - 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 01, for Closeout Submittals and Division 23, Section 230020 - "Basic Mechanical Requirements."
 - 3. Provide Service Manuals for each motor specified.
- B. Provide three (3) hours of factory authorized training to Owner's operating personnel.
 - 1. Schedule training with at least seven (7) days advanced notice to Owner's Representative.
 - 2. Refer to Section 230010 - "Mechanical General Provisions" for video taping requirements.

END OF SECTION 23 05 13



SECTION 23 05 14 – MOTOR STARTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. All motor starters specified under this section shall be provided by the same manufacturer.
- B. All motor starters installed in return air plenums shall be plenum rated.
- C. Extent of motor starter work is indicated by drawings and schedules. All motors and mechanical equipment provided with motors supplied by the Division 23 Contractor shall be also provided with Motor Starters and/or Variable Frequency Drives. It is the responsibility of the Division 23 Contractor to ensure that all Motor Starters/VFDs are sized and suitable for the intended purpose of the mechanical equipment provided.
- D. Disconnecting means unless integral to the Starter/VFD shall be provided by the Division 26 Contractor.
- E. Types of motor starters specified in this section include the following:
 - 1. Magnetic.
 - 2. Manual.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacturer of motor starters, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing motor starters similar to that required for the project.
- C. NEC Compliance: As a minimum, comply with NEC as applicable to wiring methods, construction, and installation of motor starters.
- D. NFPA Compliance: As a minimum, comply with applicable requirements of NFPA 70E "Standard for Electrical Safety Requirements for Employee Workplaces".
- E. UL Compliance: As a minimum, comply with applicable requirements of UL 468A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", and UL 508, "Electrical Industrial Control Equipment", pertaining to installation of motor starters.
- F. IEE Compliance: As a minimum, comply with applicable requirements of IEE STD 241, "Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to motor starters.

- G. NEMA Compliance: As a minimum, comply with applicable portions of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies", Maximum), pertaining to motor controllers/starters and enclosures.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on motor starters.
- B. Shop Drawings: Submit layout drawings of motor starters showing accurately scaled equipment locations and spatial relationships to associated motors.
- C. Wiring Diagrams: Submit wiring diagrams for motor starters showing connections to electrical power panels, feeders, and equipment. Clearly differentiate between portions of wiring that are manufacturer-installed and portions to be field-installed.
- D. Maintenance Stock - Fuses: For types and ratings required, furnish additional fuses, amounting to one set for every 10 installed units, but not less than 5 sets of each.

1.5 DELIVERY & STORAGE

- A. Motor Starter(s) shall be stored and handled per manufacturer's recommendations.
 - 1. Deliver motor starter(s) from the factory properly secured, crated, and protected with factory plastic shrink wrap or other protective wrap.
 - 2. Lift and support motor starter(s) with the manufacturer's designated lifting or supporting points.
 - 3. Disassemble and reassemble motor starter(s) as required for movement into the final location following manufacturer's written instructions.
 - 4. Deliver motor starter(s) as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.
 - 5. Store motor starter(s) to prevent damage to starter(s). Store units out of the elements and maintain factory protective covering until ready for installation.
- B. Lift and support motor starter(s) with the manufacturer's designated lifting or supporting points.
- C. Disassemble and reassemble motor starter(s) as required for movement into the final location following manufacturer's written instructions.
- D. Deliver motor starter(s) as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering motor starters which may be incorporated in the work are as follows:
 - 1. Allen-Bradley Co.
 - 2. Cutler Hammer Products, Eaton Corp.
 - 3. General Electric Co.
 - 4. GTE Products Corp.
 - 5. Gould, Inc.
 - 6. Square D Co.
 - 7. Westinghouse Corp.
 - 8. Siemens, Inc.

2.2 MOTOR STARTERS

- A. General: Except as otherwise indicated, provide motor starters and ancillary components which as a minimum, comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation.
- B. Magnetic Starter Requirements: Provide magnetic starters for motors 3/4 hp and larger, and for smaller motors where interlock or automatic operation with other equipment is indicated. Include the following accessories for all starters:
 - 1. Provide UL Listing as a unit. Starters assembled with only UL components will not be acceptable.
 - 2. Maintained-contact push buttons and pilot lights, properly arranged for single-speed or multi-speed operation as indicated.
 - 3. Trip-free thermal adjustable overload relays, each phase.
 - 4. Interlocks, pneumatic switches, and similar devices as required for coordination with control requirements of Section 230900 – "Building Automation System" sections.
 - 5. Built-in 120-volt control circuit transformer with fused secondary, fused from line inside, where service exceeds 240 volts.
 - 6. Pilot Light; Red - "On"
 - 7. Pilot Light; Green - "Off"
 - 8. Auxiliary Contact Block
 - 9. Externally operated manual "Reset" overload relay button mounted on door/cover of the unit.
 - 10. 2-Point terminal strip with "H-O-A" Selector switch
 - 11. Hinged cabinet cover. Lift cover is not acceptable.
 - 12. Enclosure - Rated for exposure indicated on plans unless otherwise specifically indicated.
 - 13. Under-voltage release or protection.
 - 14. Lockable Handle "OFF" position switch.
- C. AC Fractional HP Manual Starters: Provide manual single-phase fractional HP manual motor starters, of sizes and ratings indicated. Equip with manually operated quick-make, quick-break toggle mechanisms; and with one-piece melting alloy type thermal units. Starter to become inoperative when thermal unit is removed. Provide starters with double break silver alloy contacts, visible from both sides of starter; green pilot lights, and switch capable of being padlocked "OFF". Enclose starter unit in NEMA Type 1, 12, 4X, or 3R general purpose enclosure suitable for surface mounting according to the environment in which the starter is installed. Coat with manufacturer's standard color finish.
- D. Full Voltage Non-Reversing Starters: Starters for three phase motors 10 horsepower and below.
 - 1. Provide combination type starter/disconnect, full voltage non-reversing (FVNR), with magnetic NEMA rated contactors rated for horsepower of motor served.
 - 2. Adjustable trip magnetic circuit breaker disconnect (motor circuit protector) capable of being padlocked in the open position (power off).
 - 3. 10K AIC minimum fault rating with higher rating, when necessary, due to available fault levels.
 - 4. Starters shall have a fused 100VA minimum control transformer (120V, unless required otherwise).
 - 5. Provide HOA switch, push to test operating pilot light, solid state overload relays set for actual motor nameplate full load amps, and phase failure and phase reversal protection relays.
 - 6. Provide minimum two (2) N.O. and two (2) N.C. auxiliary contacts and terminal blocks factory pre-wired for field wiring.

7. Starters shall be housed in a NEMA 1 enclosure for indoor applications and NEMA 3R enclosure for outdoor or wet locations. NEMA 12 enclosures shall be provided for installation in return air plenums or dirty/dusty indoor locations. NEMA 4X Stainless Steel enclosures shall be installed in corrosive environments.
8. Coat with manufacturer's standard color finish.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR STARTERS

- A. Install motor starters, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, UL, and NEMA standards, to ensure that products fulfill requirements.
- B. Coordinate with other work including motor and electrical wiring/cabling work, as necessary to interface installation of motor starters with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A.
- D. Install fuses in fusible disconnects, if any.

3.2 ADJUSTING AND CLEANING

- A. Inspect electrical starter's operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

3.3 FIELD QUALITY CONTROL

- A. Subsequent to connecting wire/cables, energize motor starter circuitry and demonstrate functioning of equipment in accordance with requirements; where necessary correct malfunctioning units, and then retest to demonstrate compliance. Ensure that direction of rotation of each motor fulfills requirements.

3.4 TRAINING & DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 01, Section 017780 - "Closeout Submittals" and Division 23, Section 230020 - "Basic Mechanical Requirements."
 3. Provide Service Manual for each specified motor starter.
- B. Provide three (3) hours of factory authorized training.
 1. Refer to Section 230010 - "Mechanical General Provisions" for video taping requirements.
 2. Schedule training with Owner's Representative with at least seven (7) days notice.

**PRELIMINARY
NOT FOR
CONSTRUCTION**

Associated Design Group, Inc.
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SECTION 23 05 23 – HVAC VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. All valves specified under this section shall be provided by the same manufacturer.
- B. This Section includes general duty valves common to most mechanical and plumbing piping systems. Valves identified in this section include:
 - 1. Gate Valves
 - 2. Globe Valves
 - 3. Ball Valves
 - 4. Butterfly Valves
- C. Special purpose valves such as automatic control valves, are specified in the individual piping system specifications.

1.3 SUBMITTALS

- A. Submittal Format:
 - 1. Provide submittal data categorized by use, type, and size.
- B. Product Data: Include the following:
 - 1. Body material
 - 2. Valve design
 - 3. Pressure and temperature classification
 - 4. End connection details
 - 5. Seating materials
 - 6. Trim material and arrangement
 - 7. Dimensions and required clearances
 - 8. Installation instructions
 - 9. Include pressure drop curve or chart for each type and size valve.
- C. Maintenance Data: Submit maintenance data and spare parts list for each type of valve. Include this data in Maintenance Manuals.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide valves of same type and same manufacturer.
- B. Valve Identification: As a minimum, comply with the MSS SP-25 [Standard Marking System] for valves, fittings, flanges and unions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves for shipping as follows:

1. Ensure valves are dry and internally protected against rusting and galvanic corrosion.
2. Protect valve ends against mechanical damage to threads, flange faces, and weld end preps.
3. Set valves in best position for handling. Globe, and gate valves shall be closed to prevent rattling; ball and plug valves shall be open to minimize exposure of functional surfaces; butterfly valves shall be shipped closed or slightly open; and swing check valves shall be blocked in either closed or open position.

B. Storage: Use the following precautions during storage:

1. Do not remove the valve end protectors unless necessary for inspection; then reinstall for storage.
2. Protect valves against weather. Where practical store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement and protect in watertight enclosures.
3. Handling: Valves whose size requires handling by crane or lift shall be slung or rigged to avoid damage to exposed valve parts. Handwheels and stems, in particular, shall not be used as lifting or rigging points.

1.6 EXTRA MATERIALS

A. Provide two (2) re-packing kits for each size and type of valve.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide valves from one of the manufacturers listed except for specialty valves.

1. Nibco
2. Watts
3. Stockham
4. Milwaukee
5. Keystone
6. Milliken
7. Hammond

2.2 TYPICAL GENERAL-PURPOSE VALVE FEATURES

A. General: As a minimum, comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.

B. Valve Design: Except for quarter turn valves, only valves having a rising stem, or rising outside screw and yoke stems shall be permitted; except, non-rising stem valves may be used only where headroom prevents full extension of rising stems.

1. Pressure and Temperature Ratings: Valves shall be as scheduled and required to suit system pressures and temperatures.

2. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
3. Operators: Provide the following special operator features:
 - a. Handwheels: Fastened to valve stem, for valves other than quarter turn.
 - b. Lever Handle: On quarter-turn valves 6 inch and smaller, except for plug valves. Provide one wrench for every 10 plug valves.
 - c. Gear drive operators: On quarter-turn valves 8 inches and larger.
 - d. Chain operators: Provide chain operator on all OS&Y or gear-operated valves 6 inches and larger which are located higher than 8'-0" above finished floor. Chain shall extend down to 6'-6" above finished floor.
4. Extended Stems: Where insulation is specified, provide extended stems arranged to receive thickness of insulation specified.
5. End Connections: As specified within the individual valve specifications.
 - a. Threads: As a minimum, comply with ANSI B2.1.
 - b. Flanges: As a minimum, comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
 - c. Solder-Joint: As a minimum, comply with ANSI B16.18. - Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.
 - d. Butt Weld: As a minimum, comply with ANSI B16.25

C. Typical Valve Features:

1. Operators: Provide the following special operator features.
 - a. Hand Wheels: Hand wheels shall be fastened to valve stem, for valves 6 inches and below and for all valves other than quarter turn valves.
 - b. Lever Handles: On all quarter turn valves six inches and smaller, except for plug valves. Provide one wrench for every ten (10) plug valves of each size.
 - c. Gear Operators: Provide gear operators on all valves eight inches and larger.
 - d. Chain Operators: Provide chain operators on valves located 8'-0" or more above finished floor in central plants, mechanical equipment rooms or attics.

2.3 BALL VALVES

A. (HVAC Chilled Water and Hot Water Heating & Drain lines) Ball Valves - 1 Inch and Smaller:

1. Pressure: Rated for 150 psi WSP/600 psi WOG pressure
2. Construction: 2-piece construction
3. Body: Cast Bronze conforming to ASTM B 584
4. Tailpiece: Brass Hex Rod
5. Port: Full port
6. Ball: chrome-plated brass ball
7. Seal: Reinforced PTFE, 15% glass filled
8. Stem: Brass round rod - blowout proof stem
9. Washer: Reinforced PTFE, 15% glass filled
10. Packing: PTFE
11. Packing Nut: Brass Hex Rod
12. Handle: Vinyl-covered steel, zinc coated, locking On/Off handle
13. Handle Nut: Steel w/zinc coating
14. Provide solder ends for all copper tube connections, (i.e. domestic hot and cold-water service).
15. Provide screwed ends for all steel pipe connections, (i.e. - drain lines, chilled water lines, hot water heating lines, and condenser water lines).
16. Provide union upstream of all screwed valves.

<u>MANUFACTURER</u>	<u>THREADED ENDS</u>	<u>SOLDER ENDS</u>
Watts	B-6800-LL	B-6801-LL
Stockham	S216-BR-RT	S216-BR-RS
Nibco:	T-585-70	S-585-70
Milwaukee:	BA-400/BA-475-B	BA-450/BA-485-B
Hammond	8901	8911

B. (HVAC Chilled Water and Hot Water Heating) Ball Valves - 1-1/4 Inch to 2-1/2 Inch:

1. Pressure: Rated for 150 psi WSP/400 psi WOG pressure
2. Construction: 3-piece construction
3. Body: Bronze body conforming to ASTM B 62
4. Port: Full port
5. End Cap: Bronze ASTM B 62
6. Stem: Brass ASTM B 16
7. Ball: Chrome-plated brass ball
8. Seats: PTFE, 15% glass filled
9. Stem Washer: PTFE, 15% glass filled
10. Gland: Brass ASTM B 16
11. Stem Seal: PTFE
12. Handle: Vinyl-covered, zinc plated steel with locking On/Off handle
13. Body Seal: PTFE
14. Body Bolt: Steel ASTM A 307
15. Body Nut: Steel ASTM A 307

<u>MANUFACTURER</u>	<u>THREADED ENDS</u>	<u>SOLDER ENDS</u>
Watts	B-6800-LL	B-6801-LL
Conbraco (Apollo):	82-100	82-200
Nibco:	T-595-Y-LL	S-595-Y-LL
Milwaukee:	BA-300	BA-350
Hammond	8604	8614

2.4 BUTTERFLY VALVES

- A. (HVAC Chilled Water and Hot Water Heating) Butterfly Valves - 2-1/2 Inch and Larger: MSS SP-67; 200 psi, cast iron lug type body conforming to ASTM A 126, Class B material standards. Valves shall have field replaceable EPDM sleeve, with ASTM-B 148 UNS C95200 Grade A aluminum bronze disc, 416 stainless steel stem, bronze bearings, and EPDM O-ring stem seals. Sizes 2 through 6 inches shall have lever operators with locks, and sizes 8 through 24 inches shall have gear operators with position indicator. All butterfly valves 2" thru 12" shall be rated at 200 psi working pressure. All butterfly valves 14" and larger shall be rated at 150 psi working pressure. Valves installed in "Dead-End" applications shall be rated for 150 psi working pressure for valves 2" thru 12" and 100 psi for 14" and above. All valves shall be lug type, drilled and tapped with the following construction:

1. Body: Cast Iron ASTM A 126, Class B
2. Lever: 10 position memory stop iron construction
3. Disc: Aluminum Bronze ASTM B 148, Alloy 954/955
4. Stem: Stainless Steel ASTM A 582, Type 416
5. Nameplate: Aluminum
6. Key: Steel ASTM A-108 Grade 1045
7. Bushing: Bronze ASTM B-584 Grade C83600
8. Main Bearing: Nylon
9. Dirt Seal: Buna-N, ASTM D2000

10. Stem Seal: Buna-N, ASTM D2000
11. Sleeve: EPDM, ASTM D2000
12. Pin: Stainless Steel
13. Lower Dirt Seal: BUNA-N, ASTM D2000
14. Seat: EPDM
15. Provide chain operator where valve is located higher than 8'-0" AFF

LUG BODY

MANUFACTURER	LEVER	GEAR
Watts	BF-03-121-15	BF-03-121-15
Conbraco-Apollo:	6L-14X-01	6L-14X-02
Nibco:	N150-2-3-5-LH	N150-2-3-5-GO
Stockham:	LD-712-B53-E	LD-722-B53-E
Hammond	6200	6200
Milwaukee	CL223E/ML323E	ML323E
Bray	31H Series	31H/Series 4

2.5 SPECIALITY VALVES

- A. Stop Valves: 1" & 3/4" (female; cup): Interchangeable stem and bonnet assemblies, 125 lb. CWP to 100 deg F, Max Temp 180 deg F. Provide end cap and chain.

1. Spec: MSS SP-80; Type 1, Class 125 CWP
2. Body: Cast Copper-based Alloy (C84400), threaded or solder ends
3. Bonnet: Cast Copper-based Alloy (C84400)
4. Seat Disk Screw: Stainless Steel, Type 430
5. Seat Disc: Buna-N
6. Stem: Cold-formed Copper Alloy
7. Packing Nut: ASTM B-16 Brass
8. Packing: Graphite Impregnated Fibers
9. Handwheel: Aluminum
10. Handle Screw: Carbon Steel - Dichromate finish
11. Identification Plate: Aluminum

MANUFACTURER	CLASS 125
Watts	SWT
Milwaukee:	F-2974-MSC
Nibco:	75, 75-K, 725
Stockham:	WG-970

- B. Gage Cocks: Brass, tee handle, male to female, 200 psi working pressure, 1/4". Conbraco 41 Series or approved equal.
- C. Drain Valves: Bronze ball valve, garden hose end, cap and chain - 3/4".
1. Manufacturers:
 - a. Watts B-6000-CC
 - b. Milwaukee BA-110-H.

2.6 BALANCING VALVES

- A. Low to Medium Flow HVAC Balancing Valves:
1. Threaded Ends 3" and Smaller: Furnish and install as shown on plans and with manufacturer's recommendations calibrated balancing valves. All valves 1/2" to 3" pipe size shall be of bronze body/brass ball construction. Valves to be of the "blow-

- out" proof bottom loaded stem design. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates and be leak-tight at full working pressure. All valves to have pressure gauge tappings across valve seat area, with internal check valves and drip caps. End connections shall be threaded. Watts Regulator CSM-61-M1-T, Bell & Gossett "Circuit Setter", or approved equal.
2. Solder Ends 2" and Smaller: Furnish and install as shown on plans and with manufacturer's recommendations calibrated balancing valves. All valves 1/2" to 2" pipe size shall be of bronze body/brass ball construction. Valves to be of the "blow-out" proof bottom loaded stem design. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates and be leak-tight at full working pressure. All valves to have pressure gauge tappings across valve seat area, with internal check valves and drip caps. End connections shall be solder ends. Watts Regulator CSM-61-M1-S, Bell & Gossett, or approved equal.
 3. Flanged Ends 4" and Larger: Furnish and install as shown on plans and with manufacturer's recommendations calibrated balancing valves. Valves shall be of bronze body/brass plug construction. Valves to be of the "blow-out" proof bottom loaded stem design. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates and be leak-tight at full working pressure. All valves to have pressure gauge tappings across valve seat area, with internal check valves and drip caps. End connections shall be flanged. Watts Regulator CSM-81-M1-F, Bell & Gossett, or approved equal.

B. Medium to High Flow HVAC Balancing Valves:

1. Grooved Ends 2 1/2" thru 12": Approved balancing valves shall have to 1/4" NPT brass metering ports with check valves and gasketed caps located on both sides of valve seat. Two additional 1/4" NPT connections with brass plugs are to be provided on the opposite side of the metering ports for use as drain connections. Drain connections and metering ports are to be interchangeable for measurement flexibility when valves are installed in tight locations. The valve must be capable of field conversion from the factory-standard straight pattern to an optional angle pattern with standard tools and no additional parts, allowing the valve to be used as a replacement for angles or elbows, with the conversion to not affect the valves accuracy. The valve body shall be ductile iron with industrial standard grooved ends. Valve stem and plug disc shall be bronze with ergonomically designed hand-wheel with multi-turn hand-wheel adjustments. Sizes 2 1/2" and 3"-five turns, 4" to 6"-six turns, 8" and 10"-twelve turns, and 12"-fourteen turns. Watts flange adapters shall be supplied to prevent rotation. Watts Regulator CSM-91, Bell & Gossett, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials, such as blocks used which prevents disc movement during shipping and handling.
- B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the position in which it was shipped.

- C. Examine threads on both the valve and the mating pipe for form (out-of-round or local indentation) and cleanliness.
- D. Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size and material, and for freedom from defects and damage.
- E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.

3.2 VALVE END SELECTION

- A. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size 2 Inch and Smaller: Solder ends.
 - 2. Steel Pipe Sizes 3 Inch and Smaller: Threaded.
 - 3. Steel Pipe Sizes 4 Inch and Larger: Flanged

3.3 VALVE INSTALLATIONS

- A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe ball, and butterfly for throttling duty.
 - 1. Refer to piping system specification sections for specific valve applications and arrangements.
 - 2. At all OS&Y or gear operated valves located 8'-0" above finished floor, provide chain operator. Chain shall extend down to 6'-0" above finished floor.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices.
- D. Install valves in horizontal piping with stem at or above the center of the pipe.

3.4 SOLDER CONNECTIONS

- A. Cut tube square and to exact lengths.
- B. Clean end of tube to depth of valve socket, using steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.
- C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.
- D. Open gate to fully open position.
- E. Remove the cap and disc holder of swing check valves with composition discs.
- F. Insert tube into valve socket making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.
- G. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating the valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.5 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
- D. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.6 FIELD QUALITY CONTROL

- A. Testing: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leaks persist.

3.7 ADJUSTING AND CLEANING

- A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

END OF SECTION 23 05 23



SECTION 23 05 29 – HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.4 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. Listing and Labeling: Provide hangers and supports that are listed for their intended use.
 - 1. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.
- C. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.
1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 2. Design Mix: 5000-psi, 28-day compressive strength.
 3. Water: Potable.
 4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

- E. Install building attachments within concrete or 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, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- J. Support fire protection systems piping independent of other piping.
- K. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- L. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- N. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

THICKNESS NPS (Inches)	LENGTH (Inches)
1/4 to 3-1/2	12 0.048
4	12 0.060
5 and 6	18 0.060
8 to 14	24 0.075
16 to 24	24 0.105
 - 4. Pipes 8 Inches and Larger: Include pressure treated wood inserts.
 - 5. Insert Material: Length at least as long as the protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make a smooth bearing surface.
- C. Provide housekeeping pads where indicated on plans.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 ESCUTCHEONS, SLEEVES AND RISER CLAMPS

- A. Contractor shall furnish and install all escutcheons, inserts, thimbles, hangers, etc. required for the proper support and installation of his equipment and piping and he shall cooperate with other trades in locating and placing these items.
- B. Contractor shall furnish and install all piping sleeves required. Sleeves passing through structural members or concrete footings shall be of cast iron or Schedule 40 steel pipe. Sleeves passing through nonstructural walls or floors shall be of 26-gauge galvanized iron. Joints between sleeves and pipes passing through floors shall be made weather tight with plastic materials. Where pipes pass through waterproofing membrane, flashing sleeves shall be installed. Sleeves of structural members shall be as detailed on structural plans.
- C. Provide malleable iron split ring hangers with rod supports as specified. Strap hangers or wire will not be accepted. Spacing of hangers shall be as required above by MSS Standards. Maximum spacing shall no case exceed the following: For cast iron pipes 5ft.; for other than soil pipes 10 ft.
- D. Provide galvanized iron shields between hangers and pipe covering.
- E. Provide heavy steel riser clamps on vertical risers at floors to support pipes.
- F. Provide chrome plated brass escutcheons wherever pipes pass through floors, walls or ceilings in exposed or finished areas.

- G. All piping projecting from chases shall be rigidly supported in the wall or chase. Loosely supported piping, fixtures or accessories will not be accepted.

3.7 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of 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 by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Division 09 Section "Paints and Coatings."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 05 29



SECTION 23 05 48 – VIBRATION ISOLATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Work in this Section includes but is not limited to the following:
 - 1. Vibration isolation for piping, ductwork, and equipment.
 - 2. HVAC Equipment isolation bases.
 - 3. Flexible piping connections.
 - 4. Resilient pipe anchors and guides.
- B. Provide vibration isolation on all mechanical equipment, piping, and ductwork as indicated on equipment installation details or where recommended by equipment manufacturer.
 - 1. All equipment, piping and ductwork shall be mounted or suspended from vibration isolators to reduce the transmission of vibration and mechanically transmitted sound to the building structure.
 - 2. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
- C. All isolation materials and equipment shall be provided by the same manufacturer.
- D. Any variance or non-compliance with this section shall be corrected by the contractor in a manner approved by the Owner's Representative.
- E. Provide minimum static deflection of isolators for equipment in accordance with weight supported and associated seismic zone.

1.3 SECTION INCLUDES

- A. Mountings:
 - 1. Spring Mountings
 - 2. Restrained:
 - a. Spring
- B. Hangers:
 - 1. Spring & Neoprene
 - 2. Spring Only

- C. Bases:
 - 1. Integral Steel
 - 2. Saddle & Bracket
 - 3. Concrete Forms
 - a. Welded Base
 - b. Bolted Base
 - 4. Curb Mounted Aluminum Base
 - 5. Rooftop Spring Curbs
- D. Flexible Rubber Connectors
- E. Flexible Metallic Hoses
- F. Wall, Floor & Ceiling Seals
- G. Pipe Anchors
- H. Riser Guides
- I. Horizontal Pipe Isolation
- J. Pipe Riser Isolation
- K. Duct Isolation

1.4 SUBMITTALS

- A. Submit under provisions of Division 01, "Submittal Procedures".
- B. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.
 - 1. Submit details of equipment bases including dimensions, structural member sizes, and support point locations.
 - 2. Submit details of isolation hangers for ceiling hung equipment, piping, and ductwork.
 - 3. Submit details of mountings for floor supported equipment, piping and ductwork.
 - 4. All hanger, mounting or pad drawings shall indicate deflections and model numbers as well as any other requirements within the specifications.
 - 5. Spring diameters, rated loads and deflections, heights at rated load and closed height shall be provided for all springs in tabular form.
 - 6. Provide complete flexible connector details.
- C. Product Data:
 - 1. Provide schedule of vibration isolator type with location and load on each.
 - 2. Provide schedules of flexibly mounted equipment, referenced by drawing number.
 - 3. Provide catalog cuts or data sheets on vibration isolators.
- D. Manufacturer's Installation Instructions: Indicate special procedures and setting dimensions.
- E. Manufacturer's Certificate: Certify that isolators are properly installed and adjusted to meet or exceed specified requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01- "Closeout Procedures" and "Closeout Submittals".
- B. Record actual locations of isolation hangers including attachment points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Peabody
 - 2. Kinetics
 - 3. Mason Industries, Inc.
 - 4. Vibration Elimination Co., Inc.
- B. Substitutions: Under provisions of Division 01- "Submittal Procedures".

2.2 MOUNTINGS

- A. Type "B" Isolation - Spring Isolators:
 - 1. Design: Free standing, laterally stable without housing.
 - 2. Construction: All metal surfaces shall be neoprene coated
 - a. Provide molded neoprene cup or 1/4" neoprene acoustical friction pad between baseplate and support.
 - b. Provide leveling bolts rigidly attached to the equipment being isolated.
 - c. Installed and operating heights shall be the same.
 - 3. Ratio of spring diameter divided by the compression spring height shall be no less than 0.8.
 - 4. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
 - 5. Submittals shall include spring diameters, deflection, compression spring height, and solid spring height.
 - 6. Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.
 - 7. Mountings shall be Type "SLF" as manufactured by Mason Industries, Inc. or approved equal.
- B. Type "D" Isolation - Restrained Mountings:
 - 1. Design: Steel springs similar to Type "B" isolators described above but with neoprene acoustical pads within a rigid sided housing.
 - a. When equipment is at full operating weight, springs shall be adjustable to assume the weight placed and the temporary spacers removed.
 - b. Spacers shall be removable without changing the installed or operating weights.
 - c. Restraining bolts shall have large rubber grommets to provide cushioning in the vertical and horizontal modes.
 - d. The hole through the bushing shall be a minimum of 3/4" diameter larger than the restraining bolt.

- e. Horizontal clearances on the side of the isolator between the spring assembly and the housing itself shall be a minimum of 1/2" to avoid bumping and interference with the spring action.
- f. Provide vertical limit stop that are out of contact during normal operation.
- 2. Construction: Vertical stop limits to prevent spring extension when weight of equipment is removed
 - a. Temporary steel spacers shall be provided between the upper and lower housings.
 - b. Housing shall serve as blocking during erection.
 - c. Housing and springs shall be powder coated and hardware shall be electro-galvanized.
- 3. Mountings shall be Type "SLR" as manufactured by Mason Industries, Inc. or approved equal.

2.3 HANGERS

A. Type "F" Isolation - Spring & Neoprene Hangers:

- 1. Spring Isolators: Similar to Type "B" previously described except with rigid steel frames containing 1 1/4" thick neoprene elements at the top with spring seated in a steel washer reinforced neoprene cup at the bottom.
 - a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
- 2. Spring hangers shall be Type "30N" as manufactured by Mason Industries, Inc. or approved equal.

B. Type "H" Isolation - Hangers:

- 1. Hangers shall be manufactured with minimum characteristics as in Specification Type "B", but without the neoprene element.
- 2. Springs shall be seated in a steel washer reinforced neoprene cup that has a neoprene bushing projecting through the bottom hole to prevent rod to hanger contact.
- 3. Spring diameters and the lower hole sizes, shall be large enough to allow the hanger rod to swing through a 30-deg. arch from side to side before contacting the cup bushing.
- 4. If ducts are suspended by flat strap iron, the hanger assembly shall be modified by the manufacturer with an eye on top of the box and on the bottom of the spring hanger rod to allow for bolting to the hanger straps.
- 5. Submittals on either of the above hangers shall include a scale drawing of the hanger showing the 30-deg. capability.
- 6. Hangers for rods shall be Type "30" or for straps, Type "W30N" as manufactured by Mason Industries, Inc as basis of design.

2.4 HORIZONTAL TYPE THRUST RESTRAINTS

A. Type "I" Isolation - Restraints:

- 1. When total air thrust exceeds 10% of the isolated weight, floor mounted or suspended air handling equipment shall be protected against excessive displacement by the use of horizontal thrust restraints.
- 2. The restraints shall consist of a modified Specification B spring mounting.
- 3. Restraint springs shall have the same deflection as the isolator springs.
- 4. The assembly shall be pre-set at the factory and fine-tuned in the field to allow for a maximum of 1/4" movement from stop to maximum thrust.

5. The assemblies shall be furnished with rod and angle brackets for attachment to both the equipment and duct work or the equipment and the structure.
6. Restraints shall be attached at the center line of thrust and symmetrically on both side of the unit.
7. Horizontal thrust restraints shall be Type "WB" as manufactured by Mason Industries, Inc. or approved equal.

2.5 BASES

A. Type "J" Steel Beam Bases:

1. Vibration isolation manufacturer shall furnish integral structural steel bases.
2. Rectangular bases are preferred for all equipment.
3. Pump bases may be T or L shaped.
4. Pump bases for split case pumps shall be large enough to support suction and discharge elbows.
5. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base.
6. Base depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.
7. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1".
8. Bases shall be Type "WF" as manufactured by Mason Industries, Inc. as basis of design.

B. Type "K" Isolation - Bases:

1. Vibration isolation manufacturer shall provide steel members welded to height saving brackets to cradle equipment having legs or bases that do not require a complete supplementary base.
2. Members shall have sufficient rigidity to prevent distortion of equipment.
3. Inverted saddles shall be Type "ICS" as manufactured by Mason Industries, Inc. as basis of design.

C. Type "L" Isolation - Bases:

1. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating concrete bases.
 - a. Bases for split case pumps shall be large enough to provide support for suction and discharge elbows.
 - b. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6".
 - c. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity.
 - d. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place of 6" centers running both ways in a layer 1-1/2" above the bottom.
 - e. Forms shall be furnished with steel templates to hold the anchor bolt sleeves and anchor mounting locations to maintain a 1" clearance below the base.
 - f. Forms shall be factory painted with rust preventive prime coat suitable and ready for final finish coat.
 - g. Wooden formed bases leaving a concrete rather than a steel finish are not acceptable.
 - h. Base shall be Type "BMS" or Type "BMK" as manufactured by Mason Industries, Inc. or equal.

2.6 FLEXIBLE RUBBER CONNECTORS

A. Type "O" Isolation -Connectors:

1. Rubber expansion joints shall be peroxide cured EPDM throughout with Kevlar tire cord reinforcement.
 - a. Substitutions must have certifiable equal or superior characteristics.
2. Raised face rubber flanges shall encase solid steel rings to prevent pull out. Flexible cable wire is not acceptable.
3. Size 1-1/2" through 14" shall have a ductile iron external ring between the two spheres.
 - a. Sizes 16" through 24" may be single sphere.
 - b. Sizes 3/4" through 2" may have one sphere, bolted threaded flange assemblies and cable retention.
4. Minimum ratings through 14" shall be 250 psi at 170 deg. F and 215 psi at 250 deg. F., 16" through 24", 180 psi at 170 deg. F and 150 psi at 250 deg. F.
 - a. Higher published rated connectors may be used where required.
5. Safety factors shall be a minimum of 3/1.
 - a. All expansion joints must be factory tested to 150% of maximum pressure for 12 minutes before shipment.
6. The piping gap shall be equal to the length of the expansion joint under pressure.
 - a. Control rods passing through 1/2" thick Neoprene washer bushings large enough to take the thrust at 100psi of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them.
7. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer.
8. All expansion joints shall be installed on the equipment side of the shut off valves.
9. Expansion joints shall be "SAFEFLEX", Type "SFDEJ", Type "SFEJ", Type "SFDCR" or Type "SFU" and Control Rods "CR" as manufactured by Mason Industries, Inc. or approved equal.

2.7 FLEXIBLE METALLIC HOSES

A. Type "P" Isolation - Hoses:

1. Flexible stainless-steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes may have male nipples. Minimum lengths shall be as tabulated below:

FLANGED CONNECTIONS		
3" x 14" (75 x 350mm)	6" x 20" (150 x 500mm)	12" x 28" (300 x 700mm)
4" x 15" (100 x 375mm)	8" x 22" (200 x 550mm)	14" x 30" (350 x 750mm)
5" x 19" (125 x 475mm)	10" x 26" (250 x 650mm)	16" x 32" (400 x 800mm)
MALE NIPPLES		
1/2" x 9" (12 x 225mm)	1-1/4" x 12" (32 x 300mm)	2" x 14" (50 x 350mm)

3/4" x 10" (19" x 250mm)	1-1/2" x 13" (38 x 325mm)	2-1/2" x 18" (64 x 450mm)
1" x 11" (25 x 275mm)	-----	-----

2. At equipment, hoses shall be installed on the equipment side of the shut-off valves horizontal and parallel to the equipment shafts wherever possible.
3. Hoses shall be Type "BSS", Type "BSSRF", or Type "BSSMN" as manufactured by Mason Industries, Inc.

2.8 WALL, FLOOR AND CEILING SEALS

A. Type "Q" Isolation - Seals:

1. Split seals consist of pipe halves with minimum 3/4" thick neoprene sponge cemented to the inner faces.
2. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping.
3. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not in place prior to the construction of the building member.
4. Seals shall project a minimum of 1" past either face of the wall.
5. Where temperature exceeds 240 deg. F., 10 lb. density fiberglass may be used in lieu of the sponge.
6. Seals shall be Type "SWS" as manufactured by Mason Industries, Inc. or approved equal.

2.9 PIPE ANCHORS

A. Type "R" Isolation - Anchors:

1. All directional acoustical pipe anchors, consist of two sizes of steel tubing separated by minimum 1/2" thickness of 60 durometer or softer neoprene.
2. Vertical restraint shall be provided by similar material arranged to prevent up or down vertical travel.
3. Allowable loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.
4. All-directional anchors shall be Type "ADA" as manufactured by Mason Industries, Inc. or approved equal.

2.10 RISER GUIDES

A. Type "S" Isolation - Guides:

1. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer or softer neoprene.
2. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction.
3. Guides shall be capable of $\pm 1-5/8$ " motion or to meet location requirements.
4. Pipe guides shall be type "VSG" as manufactured by Mason Industries, Inc. or approved equal.

2.11 HORIZONTAL PIPE ISOLATION

A. Type "T" Isolation - Isolators:

1. The first four (4) pipe hangers in the main lines near the mechanical equipment shall be as described in specification Type "G".
2. Hangers supporting piping 2" and larger in all other locations throughout the building shall be isolated by hangers as described in Specification Type "F".
3. Floor supported piping shall rest on isolators as described in Specification Type "D".
4. Heat exchangers and expansion tanks are considered part of the piping run. The first four isolators from the isolated equipment shall have the same static deflection as specified for the mountings under the connected equipment.
5. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first four hangers shall have 0.75" deflection for pipe sizes up to and including 3", 1-1/2" deflection for pipe sizes over 3" and up to and including 6", and 2-1/2" deflection thereafter.
6. Where piping connects to mechanical equipment install specification Type "O" expansion joints or Specification Type "P" stainless hoses if Type "O" is not suitable for the service.
7. All piping passing through the equipment walls, floors or ceilings shall be protected against sound leakage by means of an acoustical seal, as described in Specification Type "Q".

2.12 PIPE RISER ISOLATION

A. Type "U" Isolation - Isolators:

1. All vertical risers shall be supported by spring isolators designed to support the riser filled with water.
2. Assigned loads must be within the building design load limits at the support points.
3. Neutral central resilient anchors close to the center of the run shall direct movement up and down.
4. Anchors shall be capable of holding an upward force equal to the water weight when the system is drained.
5. If one level cannot accommodate this force, anchors can be located on 2 or 3 adjacent floors.
6. Resilient guides shall be spaced and sized properly depending on the pipe diameter.
7. Submittals must include the initial load, initial deflection, change in deflection, final load and change in load at all spring and anchor support locations, as well as guide spacing.
8. The initial spring deflection shall be a minimum of 3/4" or four times the thermal movement at the isolator location whichever is greater.
9. Calculations shall include pipe stress at end conditions and branch off locations and the manufacturer must include installation instructions.
10. Calculations must be stamped and signed by a licensed registered professional engineer.
11. Proper provisions shall be made for seismic protection in seismic zones. Support spring isolators shall be of Type "B", Anchors of Type "R" and telescoping guides of Type "S" equipment.
12. The isolation vendor shall provide and design all brackets and clamps and anchors at riser spring guide and anchor locations.
13. The contractor shall install and adjust all isolators under the supervision and/or direction of the isolation vendor or his appointed representative.

2.13 DUCT ISOLATION

A. Type "V" Isolation - Isolators:

1. All air ducts with a cross section of two (2) sq. ft. or greater shall be isolated from building structure by Type "H" hangers or Type "B" floor supports with a minimum deflection of 3/4".
2. Isolators shall continue for a minimum length of 50 ft. from the equipment being served.
3. If air velocity exceeds 1,000 fpm, hangers or supports shall continue for an additional 50 ft. from the unit or as further defined on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all isolators in strict accordance with manufacturer's instructions.
- B. Install isolation for motor driven equipment.
- C. Horizontal pipe shall be installed in accordance with Type "T" Horizontal pipe isolators.
- D. Piping risers shall be installed in accordance with Type "U" riser isolators.
- E. All duct runs shall be installed in accordance with Type "V" duct isolators.
- F. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
 1. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.
 2. The Contractor shall not install any equipment, piping, duct, or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
 3. Coordinate work with other trades to avoid rigid contact with building.
 4. Rooftop equipment isolators shall be bolted to the equipment and structure. Mountings must be designed to withstand and resist 110 mph wind loads. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust when thrust forces exceed 10% of the equipment weight. Horizontal thrust restraints shall be Type "I" restraints.
 5. Where piping passes through walls, floors, or ceilings, the vibration isolation manufacturer shall provide Type "Q" seals.
 6. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the Contractor's expense.
 7. Any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection shall be brought to the attention of the Owner's Representative prior to installation.
 8. Locate isolation hangers as near to the overhead support structure as possible.
- G. Bases:
 1. Set steel bases for one-inch clearance between housekeeping pad and base.
 2. Set concrete inertia bases for 2-inch clearance between housekeeping pad and base.
 3. Adjust equipment level.
 4. Provide painting for final finish coat.
- H. Install spring hangers without binding.

- I. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- J. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- K. Provide pairs of horizontal limit springs on fans with more than 6.0-inch 1.5 static pressure, and on hanger supported, horizontally mounted axial fans.
- L. Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05-inch maximum clearance. Other snubbers shall have clearance between 0.15 inch and 0.25 inch.
- M. Support piping connections to isolated equipment resiliently for scheduled distance as follows:
 - 1. Up to 4 Inch Diameter: First three points of support.
 - 2. 5 to 8 Inch Diameter: First four points of support.
 - 3. 10-inch Diameter and Over: First six points of support.
 - 4. Select three hangers closest to vibration source for minimum 1.0-inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0-inch static deflection or ½ static deflection of isolated equipment.
- N. Connect wiring to isolated equipment with flexible hanging loop.

3.2 TRAINING AND DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 - 1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 - 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 01, "Closeout Submittals".
 - 3. Provide Service Manuals for each vibration isolator specified.
- B. Provide three (3) hours of factory authorized training.
 - 1. Schedule training with seven (7) days advanced notice.
 - 2. Refer to "Mechanical General Provisions".

3.3 MANUFACTURER'S FILED SERVICES

- A. Examine systems under provisions of Division 01, "Closeout Procedures".
- B. Inspect isolated equipment after installation and submit report. Include static deflections.

3.4 HORIZONTAL PIPE ISOLATION SCHEDULE

Pipe Size (Inches)	Isolated Distance from Equipment
1" & Below	120 Diameters
2	90 Diameters
3	80 Diameters
4	75 Diameters
5	70 Diameters
6	60 Diameters
8	60 Diameters
10	54 Diameters
12	50 Diameters
14	45 Diameters
16	45 Diameters
24	38 Diameters
Over 24	38 Diameters

3.5 EQUIPMENT ISOLATION SCHEDULE

ISOLATED EQUIPMENT	ISOLATOR Type/Base/Thickness	DEFLECTION * (inches)
Piping Risers	U (B-R-S)	0.75"
A/C Ductwork	V (H-B)	0.35"
Tubular & Axial Blowers	A-I	0.35"
Centrifugal Blowers	A-I	0.35"
Central Station Air Handling Units	A-I	0.35"

Note: All deflections are based upon slab on grade construction. For other applications, consult the isolation manufacturer and equipment schedules and adjust deflection accordingly.

Note: Seismic considerations shall be designed for the project in the area of earthquake zone location.

Equipment Types	Base Type	Isolator Type	Static Defl (in.)	Mason Ind. Type
Fans (including AHU, & FCU)				
Floor/Roof Supported	Per Mfr ⁽¹⁾	Spring		SLF
below - 300 rpm (or VFD)			4	
301 - 450 rpm			3.5	
451 - 600 rpm			3	
601 - 750 rpm			2	
751 - 850 rpm			1.5	
851 - greater			1	
Suspended		Sprg/Neop	(above + 0.25)	30N

(1) Vibration isolation scheme to consider fan operating force and provide thrust restraint and/or concrete inertia base in order to limit movement of fan to 1/4 inch at any operating point. Thrust restraints to have the same deflection as vibration isolation devices.

END OF SECTION 23 05 48



SECTION 23 05 53 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Valve tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 7. Fasteners: Stainless-steel rivets or self-tapping screws.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Black.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

- B. Pipe Label Color Schedule shall comply with OSHA and ANSI A13.1 Standards (Verify exact color prior to installation):
 - 1. Domestic Cold Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 2. Domestic Hot Water Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, color scheme and with piping system abbreviation.

END OF SECTION 23 05 53



SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 CERTIFICATIONS

- A. The TAB Firm must be either a member of AABC or certified by the NEBB or the TABB and certified in all categories and functions where measurements or performance are specified on the plans and specifications.
- B. TAB contractor shall be an independent third-party firm not associated with the Division 22 or 23 contractor.

1.3 SCOPE OF WORK

- A. The balancing, testing, and adjusting of the air conditioning, heating and ventilating systems shall be performed by an independent balancing company possessing calibrated instruments, qualified engineers and skilled technicians to perform all tests. The balancing agency shall be responsible for inspecting, adjusting, balancing, and logging the data on the performance of fans, air handling units, low pressure supply and exhaust ductwork, and heat exchangers. The Mechanical Contractor and the suppliers of the equipment installed shall cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components and shall furnish all labor and material required to calibrate any deficiencies in construction.
- B. This Section specifies the requirements and procedures total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications and recording and reporting the results.
- C. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems, all pressure range;
 - 2. Fresh Air
 - 3. Exhaust Air
 - 4. Return air systems
 - 5. AHUs
 - 6. Fans
 - 7. Hoods
 - 8. Fire, smoke, and combination fire/smoke damper operation
 - 9. Verify temperature control system operation;
- D. Provide assistance to Division 23 and Division 26 Contractor and project Architect in system commissioning process. Identify all system variances of greater than 10% and make required measurements, adjustments, etc. to bring systems into compliance to satisfaction of project Architect.

- E. THE TEST AND BALANCE CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING OUT AND REPORTING EACH SEQUENCE OF HEATING, COOLING AND CONTROL INTERLOCK OPERATION FOR THE EQUIPMENT REFERENCED ABOVE.

1.4 DEFINITIONS

- A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
 - 1. The balance of air distribution;
 - 2. Adjustment of total system to provide design quantities;
 - 3. Electrical measurement;
 - 4. Verification of performance of all equipment and automatic controls;
- B. Test: To determine quantitative performance of equipment.
- C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
- D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
- E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- F. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- H. Main: Duct or pipe containing the system's major or entire fluid flow.
- I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
- J. Branch main: Duct or pipe serving two or more terminals.
- K. Branch: Duct or pipe serving a single terminal.

1.5 SUBMITTALS

- A. Agency Data:
 - 1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.
- B. Engineer and Technicians Data:
 - 1. Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

- C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
- D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems. Include this information in maintenance data specified in Division 01 and Section 230020.
- E. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.
- F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
 - 1. Draft reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.
 - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports.
 - 3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - 4. General Information and Summary
 - a. Air Systems
 - b. Hydronic Systems
 - c. Temperature Control Systems
 - d. Special Systems
 - 5. Report Contents: Provide the following minimum information, forms and data:
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.
 - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.
 - 6. Provide electronic (PDF) copies of all documentation included in the Final Report.

- G. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.
- H. At the front of the Report, the TAB Contractor shall provide a summary sheet identifying system operational variances problems, etc. recommended corrective measures that in the opinion of the TAB Contractor should be enacted by the Mechanical Contractor prior to retesting. Submit to project Architect as work progresses with resolution documented for inclusion in final report.

1.6 QUALITY ASSURANCE

- A. Test and Balance Engineer's Qualifications: A Professional Engineer (independent consultant), registered in the State in which the services are to be performed, and having testing, adjusting, and balancing experience on projects with testing and balancing requirements similar to those required for this project.
- B. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.7 PROJECT CONDITIONS

- A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.8 SEQUENCING AND SCHEDULING

- A. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F wet bulb temperature of maximum summer design condition, and within 10 deg F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

- A. Before operating the system, perform these steps:
 - 1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
 - 2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
 - 3. Compare design to installed equipment and field installations.
 - 4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
 - 5. Check filters for cleanliness.
 - 6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 - 7. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.
 - 8. Determine best locations in main and branch ductwork for most accurate duct traverses.

9. Place outlet dampers in the full open position.
10. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
11. Lubricate all motors and bearings.
12. Check fan belt tension.
13. Check fan rotation.

3.2 MEASUREMENTS

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all reading with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- I. Take measurements in the system where best suited to the task.

3.3 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.
- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.4 RECORD AND REPORT DATA

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
- C. Prepare a summary sheet of noted variances in excess of $\pm 10\%$ of design value. Include all such variances, recommended resolutions and ultimate result in Appendix "A" to TAB Final Report.

3.5 DEMONSTRATION

- A. Training:
 - 1. Train the Owner's maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Review with the Owner's personnel, the information contained in the Operating and Maintenance Data specified in Division 01 and 230020.
 - 2. Schedule training with Owner through the Architect with at least 7 days prior notice.

END OF SECTION 23 05 93

SECTION 23 07 13 - INSULATION

PART 1 - GENERAL



1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. This Section includes:
 - 1. Piping insulation including fittings and valves.
 - 2. Duct insulation (internal lining and external wrapping)
- C. Cover and insulate all valves, fittings, and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run and piping system. Install factory molded, pre-cut or field cut and fabricated units (at installer's option) except where specifically noted otherwise.
- D. Maintain the integrity of vapor jackets on all pipe insulation, duct insulation, equipment insulation and protect during construction to prevent puncture or other damage.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
 - 1. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.
 - 2. Manufacturer's installation recommendations.
 - 3. Material certificates, signed by the manufacturer, certifying that materials as a minimum, comply with specified requirements where laboratory test reports cannot be obtained.
 - 4. Material test reports prepared by a qualified independent testing laboratory. Certify insulation meets specified requirements.

1.4 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
 - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.5 SEQUENCING AND SCHEDULING

- A. Schedule piping and duct insulation application only after the testing of piping and duct systems is complete and accepted.
- B. Schedule insulation application after installation and testing of heat trace tape is complete and accepted.
- C. Schedule insulation of walls and ceiling to correspond with installation of pipe hangers, supports and equipment.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe insulation shall not begin until all work has been tested and found to be tight. All insulation adhesives, sealers, tapes and mastic shall meet the latest NFPA requirements and shall meet 25/50/50 flame spread and smoke developed ratings.
- B. All insulation shall be installed in strict accordance with the manufacturer's recommendations.
- C. All pipe insulation where recommended by the manufacturer shall be banded with aluminum bands, three to a section and with one band on each side of each fitting, valve, etc.
- D. Insulation shall be continuous through walls and ceilings.
- E. All valves, strainers, etc. shall be insulated the same as its adjacent piping and the covering shall extend all the way up to the equipment.
 1. USE HIGH DENSITY INSULATION INSERTS AT HANGERS ON ALL PIPING 1-1/2" AND ABOVE TO PREVENT CRUSHING OF INSULATION.

2.2 THERMAL INSULATION

- A. After all work has been tested and approved, insulate as follows:
 1. INSULATION SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS.

2.3 CONDENSATE DRAIN PIPING

- A. Insulate with 1/2" Aerotube or Armaflex pipe insulation applied in accordance with manufacturer's recommendations and instructions.

2.4 REFRIGERANT LINES

- A. Insulate with 3/4" closed cell, tube insulation, Aerotube, Armaflex or equivalent. Apply two coats of weatherproof mastic on all piping below grade or exposed to weather. Contractor shall install refrigerant lines below grade in watertight PVC sleeve in accordance with manufacturer's recommendations.

- B. All copper refrigerant lines shall be separated from dissimilar metals at all support points.

2.5 HVAC DUCTWORK INSULATION:

- A. Supply, return, transfer, fresh air and exhaust ductwork shall be wrapped on outside with 3/4# density fiberglass insulation with aluminum foil vapor barrier with a minimum R-Value of R-6 (unless stated otherwise on mechanical drawings). Insulation shall be taped at all joints and installed per the manufacturer's recommendations.
- B. Refer to air distribution section of mechanical specifications for duct insulation supplied by the sheet metal sub-contractor.
- C. Transfer ductwork across walls shall be internally lined with 1" thick acoustical insulation.

2.6 HVAC FLEX-CONNECTIONS:

- A. Shall be wrapped on outside with 3/4 # density fiberglass insulation with aluminum foil vapor barrier with a minimum R-value of R-6. Insulation shall be taped at all joints and installed per the manufacturer's recommendations.

2.7 KITCHEN HOOD

- A. Shall be rated for 0" clearance or shall be installed in accordance with NFPA 96.

2.8 KITCHEN HOOD EXHAUST DUCTWORK

- A. Ductwork exposed to combustible construction materials shall be enclosed with 3" thick PABCO Super Firetemp M ductwrap system of inorganic mineral fiberboard, Super Calstik applied at all joints, fastened with drywall screws (length twice insulation thickness) at 8" O.C. at joints where sections meet at right angles or Thermal Ceramics Firemaster duct wrap system of 3" grease duct enclosure, 1/2" stainless steel bands, clips, insulation pins and speed clips. Duct wrap systems shall be installed in accordance with manufacturer's recommendations to meet latest N.F.P.A requirements for 0" clearance to combustibles.

2.9 KITCHEN HOOD SUPPLY DUCTWORK

- A. Wrap with 3/4 # density fiberglass insulation with aluminum foil vapor barrier with a minimum R-value of R-6. Insulation shall be taped at all joints and installed per manufacturer's recommendations.

2.10 CALIBRATED BALANCING VALVES

- A. Insulate calibrated balancing valves with molded insulated furnished with the unit and provide strap bands for access.

2.11 INSULATION THROUGH HANGERS AND SLEEVES

- A. The insulation shall be continuous through pipe hangers and pipe sleeves. At hangers where the pipe is supported by insulation, provide a galvanized iron protection shield. Provide pipes 2-inch i.p.s. and larger in insulation inserts at points of hanger supports. The inserts shall be of calcium silicate, cellular glass, prestressed molded glass fiber of minimum 13-pound density, or other approval material of the same thickness as adjacent insulation and not less than 13-pound density. The inserts shall have sufficient compression strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Inserts shall be 180 degrees and not less than

the length of the protection shield. Vapor barrier facing of the insert shall be the same as the facing on the adjacent insulation. Where copper clad hangers are used on domestic copper pipe, insulation may cover pipe and hanger. Provide 18-gauge metal saddles between all hangers and insulation.

END OF SECTION 23 07 13



SECTION 23 31 13 – METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

A. Section Includes:

- 1. Single-wall rectangular ducts and fittings.
- 2. Single-wall round ducts and fittings.
- 3. Kitchen Hood ducts.
- 4. Double-wall round and flat-oval ducts and fittings.
- 5. Sheet metal materials.
- 6. Duct liner.
- 7. Sealants and gaskets.
- 8. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical System
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

- 1. Liners and adhesives.
- 2. Sealants and gaskets.

B. Shop Drawings:

- 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
- 2. Factory- and shop-fabricated ducts and fittings.
- 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
- 4. Elevation of top of ducts.

5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including but are not limited to the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
 - g. F/A devices, wi-fi antennas, etc.

E. Welding certificates.

F. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow, LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Eastern Sheet Metal, Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and

Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 KITCHEN HOOD DUCTS

- A. Ducts shall be constructed in accordance with NFPA 96 construction standards.
- B. All ductwork shall be furnished and shall be UL listed grease duct according to the manufacturer's listing, conforming to NFPA 96 and built to lengths required. Exhaust duct connecting to collars shall be the heat expansion type, conforming to NFPA 96 recommendations. Exhaust duct to be minimum 14-gauge black iron or carbon steel and supply duct minimum 18-gauge carbon steel. All exhaust duct seams and joints shall be made liquid-tight with a continuous external weld.
- C. Ductwork shall be designed to connect directly to hood and roof package when system is installed per manufacturer's recommendations. All sections of the duct shall be constructed and installed without forming dips and traps and shall slope not less than 1 inch per foot toward either the hood or an approved residue trap.

2.4 DOUBLE-WALL ROUND INSULATED DUCT & FITTINGS

- A. Unless otherwise specified, all interior and outer shell duct and fittings shall be a minimum G-90 galvanized sheet metal in accordance with ASTM A525 and A527 specifications.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include the following:
 - a. Eastern Sheet Metal, Inc.
 - b. Hamlin Sheetmetal, Inc.
 - c. United McGill, Inc.
 - d. Semco, Inc.
 2. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not greater than 12 feet.
 3. Round Ducts: Fabricate round supply ducts with "spiral lock seam" construction, except where interior diameters exceed 72 inches. As a minimum, comply with SMACNA "HVAC Duct Construction Standards," Second Edition - 1995 with addendums, Table 3-2A and 3-2B for galvanized steel gages.
 - a. Round & Oval Ducts - Low Pressure: Solid welded (continuous welded), 1-inch insulation, perforated inner liner and with metal thickness listed below for pressure classes from minus 2 inches to plus 1 inch:
 - i. 3 to 26 inches: 24 gage.

- ii. 27 to 36 inches: 22 gage.
 - iii. 37 to 50 inches: 20 gage.
 - iv. 52 to 60 inches: 18 gage.
 - b. Round & Oval Ducts - Medium Pressure: Solid welded (continuous welded), 1-inch insulation, perforated inner liner and with metal thickness listed below for pressure classes from 2 inches to plus 6 inches:
 - i. 3 to 14 inches: 24 gage.
 - ii. 15 to 26 inches: 26 gage.
 - iii. 28 to 36 inches: 20 gage.
 - iv. 38 to 50 inches: 18 gage.
 - v. 52 to 78 inches: 14 gage.
- 4. Double-Wall (Insulated) Fittings: Fabricate double-wall insulated fittings with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.
 - a. Thermal Conductivity: 0.27 Btu/sq.ft./deg. F/inch thickness at 75 deg. F mean temperature.
 - b. Outer Shell: Base outer shell gage on actual outer shell dimensions. Gages for outer shell shall be same as for uninsulated fittings specified above.
 - c. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or non-insulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single-wall size.
 - d. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. Provide 3/32-inch-diameter perforations, with an overall open area of 23 percent. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."
 - i. 3 to 34 inches: 24 gage.
 - ii. 35 to 58 inches: 22 gage.
 - iii. 60 to 88 inches: 20 gage.
 - e. Connectors: Maintain concentricity of liner to outer shell by mechanical means. A second "inner" factory installed flange shall be provided to keep the inner liner concentric and to eliminate the need to make inner connections at the inner wall. Retain insulation from dislocation by mechanical means. Ductwork shall be provided with flanged connections (paint grip galvanized) at each fitting or coupling on all double wall ducts.
- 5. Exhibit Hall/General Assembly Exposed Ductwork: Drum louver taps are to be factory fabricated and installed double wall taps with factory installed air foil type extractors up to the first duct reducer. Extractors are to be field adjustable and provided with means of securing the extractor to the duct without the use of additional fasteners or attachments. The drum louver taps are to be of length suitable for the dimensions of the installed louver. Factory manifold taps shall be welded to the spiral duct. Tack or spot welds are not acceptable.

2.5 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.

2. Finishes for Surfaces Exposed to View: Mill phosphatized. (Paint Grip)
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.6 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product name or designation or comparable product by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 3. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 3 lbs. Density / 1 1/2" thick.
 - b. Type II, Rigid: 3 lbs. Density / 1 1/2" thick.
 4. Solvent -Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Insulation Pins and Washers:
 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- - diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.7 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Rolled Mastic Sealant
 1. Pressure-Sensitive rolled mastic sealant comprised of a foil facer with butyl adhesive
 2. Rolled Mastic Sealant: 2-inch minimum width.
 3. Rolled Mastic Sealant: 17-mil thickness; minimum
 4. Water Resistant
 5. Mold and Mildew Resistant
 6. Maximum Pressure Class: 16-inch W.C., positive/negative
 7. Service: Indoor and Outdoor
 8. Service Temperature: Minus 20 F to 200 F
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum
 10. VOC: 0 g/l, EPA Standard Method 24
 11. UL 181B-FX
- C. Water-Based Joint and Seam Sealant:
 1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 16-inch wg, positive and negative.
 8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 10. UL-181 Listed
 11. UL 2818, Green Guard Compliance
- D. Solvent-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Base: Synthetic rubber resin.
 3. Solvent: Toluene and heptane.
 4. Solids Content: Minimum 60 percent.
 5. Shore A Hardness: Minimum 60.
 6. Water resistant.
 7. Mold and mildew resistant.
 8. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 9. VOC: Maximum 395 g/L.
 10. Maximum Static-Pressure Class: 16-inch wg, positive or negative.
 11. Service: Indoor or outdoor.
 12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 13. UL-181 Listed
- E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- G. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 4. Unconditioned Space, Exhaust Ducts: Seal Class C.
 5. Unconditioned Space, Return-Air Ducts: Seal Class B.
 6. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 7. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 8. Conditioned Space, Exhaust Ducts: Seal Class B.
 9. Conditioned Space, Return-Air Ducts: Seal Class C.
- C. Seal all duct penetrations through interior and exterior building walls per 07 92 00 Joint Sealants and Section 09 29 00: 3.5 for a complete penetration seal to the satisfaction of engineer.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."

- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:
 - a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections, selected by Architect from sections installed, totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - b. Supply Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
 - c. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
 - d. Exhaust Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
 - e. Outdoor Air Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

- C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.8 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within new duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

3.10 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected Downstream of Fan Coil Units, and Terminal Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12
2. Ducts Connected to Variable-Air-Volume Air-Handling Units and Inlets of Terminal Units:
 - a. Pressure Class: Positive 4-inch wg
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 3.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3
3. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A
 - c. SMACNA Leakage Class for Rectangular: 3.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.

B. Return Ducts:

1. Ducts Connected to Air-Handling Units
 - a. Pressure Class: Positive or negative 4-inch wg.
 - b. Minimum SMACNA Seal Class: A
 - c. SMACNA Leakage Class for Rectangular: 6
 - d. SMACNA Leakage Class for Round and Flat Oval: 6
2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg>.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 3.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
2. Ducts Connected to Equipment Not Listed Above:

- a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
 - 1. Ducts Connected to Air-Handling Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 - 2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6
- E. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel
- F. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 700 fpm or Lower:
 - i. Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - ii. Mitered Type RE 4 without vanes.
 - b. Velocity 700 to 1500 fpm:
 - i. Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - ii. Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - iii. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - i. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - ii. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - iii. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - 2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - 3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - i. Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - ii. Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - iii. Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - iv. Radius-to Diameter Ratio: 1.5.
- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
- c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

J. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
- 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00 – DUCT ACCESSORIES

PART 1 - GENERAL



1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. This Section includes the following:
 - 1. Backdraft dampers.
 - 2. Manual volume control dampers.
 - 3. Motorized Dampers.
 - 4. Spin Collars.
 - 5. Fire Dampers.
 - 6. Smoke Dampers.
 - 7. Turning vanes.
 - 8. Duct-mounted access doors and panels.
 - 9. Flexible connectors.
 - 10. Flexible ducts.
 - 11. Accessories hardware.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:
 - 1. Backdraft dampers.
 - 2. Manual volume control dampers.
 - 3. Motorized Dampers.
 - 4. Spin Collars.
 - 5. Fire Dampers.
 - 6. Smoke Dampers.
 - 7. Turning vanes.
 - 8. Duct-mounted access doors and panels.
 - 9. Flexible connectors.
 - 10. Flexible ducts.
 - 11. Accessories hardware.
- C. Shop drawings from manufacturer detailing assemblies. Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail the following:
 - 1. Special fittings, volume control damper installation (both manual and automatic), and transformers details.

- 2. Fire and smoke damper installations, including sleeves and duct-mounted access door and panel installations.
- D. Product Certification: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static pressure loss, and dimensions and weights.

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Comply with the following NFPA Standards:
 - 1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
 - 2. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installation.
- B. Frame: 0.063-inch-thick 6063T extruded aluminum.
- C. Blades: 0.025-inch-thick roll-formed aluminum.
- D. Blades: 0.050-inch-thick 6063T extruded aluminum.
- E. Blade Seals: Vinyl.
- F. Blade Axles: Nonferrous.
- G. Tie Bars and Brackets: Aluminum.
- H. Return Spring: Adjustable tension.
- I. Wing-Nut Operator: Galvanized steel, with 1/4-inch galvanized-steel rod.
- J. Adjustable Pressure Controls.
- K. Dampers to be Greenheck EM-30, Ruskin BD6, Pottorff BD-150, or approved equal.

2.2 MANUAL VOLUME CONTROL DAMPERS

- A. General: Provide factory-fabricated volume-control dampers, complete with required hardware and accessories. Stiffen damper blades to provide stability under operating conditions. Provide locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class. Provide end bearings or other seals for ducts with pressure classifications of 3 inches or higher. Extend axles full length of damper blades. Provide bearings at both ends of operating shaft.
- B. Standard Volume Control Dampers: Multiple or single-blade, parallel or opposed-blade design as indicated, standard-leakage rating, with linkage outside of air stream, and suitable for horizontal or vertical applications. Greenheck MDB-15, Ruskin MD-15, Pottorff CD-10 & MD-41, or approved equal.

- C. Provide damper stand off bracket to accommodate duct insulation.

2.3 MOTORIZED DAMPERS

- A. Mechanical Contractor shall furnish and install motorized dampers as indicated on mechanical and architectural drawings. Damper shall be opposed blade motorized type equivalent to Greenheck Model VCD-23, Ruskin CD36/OB, Pottorff CD-41, or equal with actuators. Motorized dampers shall be operated by 120/1/60 electric actuator (low sound) as indicated on plans. Damper shall be complete with outboard support bearing, blade, and jamb seals. Dampers shall be low - leakage type. Dampers shall go to closed position when units are off unless otherwise noted.

2.4 SPIN COLLARS

- A. All round take-offs to round branch duct shall be made with 26-gauge spin-type collars with 26-gauge balancing dampers. These spin-collars shall be manufactured by Flexmaster Model FLD, Dace MSD, or approved equivalent.
- B. The mounting groove shall be die-formed to assure constant fit control. Balancing dampers shall be factory-installed with spring loaded, retractable bearings and a positive locking wing-nut for easy adjustment.
- C. Provide damper stand off bracket to accommodate duct insulation.

2.5 FIRE DAMPERS

- A. General: UL labeled according to UL Standard 555 "Standard for Fire Dampers."
- B. Fire Rating: 1-1/2 or 3 hours, as indicated on Contract Drawings.
- C. Frame: Type B; fabricated with roll-formed, 22-gage, galvanized-steel; with mitered and interlocking corners.
- D. Style: Dynamic
- E. Mounting Sleeve: Factory-installed galvanized steel.
 - 1. Minimum Thickness: 16 ga thick as indicated, and length to suit application.
 - 2. Factory installed sleeve shall be constructed of gauges as dictated by the manufacturers UL Listing.
 - 3. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of the wall or floor, and thickness of damper frame meets sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 22-gage galvanized steel (or as required by UL Listing). In place of interlocking blades, provide full-length, 21-gage, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include a blade lock and stainless steel negator closure spring.
- I. Fusible Link: Replaceable, 212 deg F rated.
- J. Dampers shall be 100% free area.

- K. Dampers shall be Ruskin DIB Series, Greenheck DFD Series, or equal.

2.6 SMOKE DAMPERS

- A. General: UL-labeled according to UL Standard 555S, "Standard for Leakage Rated Dampers for Use in Smoke Control Systems." Combination fire and smoke dampers shall also be UL-labeled for 1-1/2-hour rating according to UL Standard 555 "Standard for Fire Dampers." Refer to Section 230900 "Building Automation System" for additional requirements.
- B. Damper shall bear a Class 1 Leakage rating.
- C. Fusible Link: Replaceable, 212 deg F rated.
- D. Frame and Blades: 16-gage galvanized steel (or as required by UL listing).
- E. Mounting Sleeve: Factory-installed, 18-gage galvanized steel (or as required by UL listing), length to suit wall or floor application.
- F. Actuators are to be 120 volt and provided by the damper manufacturer and be UL tested with the damper.
- G. Step-Down Transformers: Refer to electrical plans for transformer required to transform to 120V, single phase which comply with UL, FM NFPA Requirements for smoke control systems.
- H. Smoke Dampers shall include factory supplied and mounted damper test switch.
- I. Dampers shall be Ruskin SD37 or Greenheck SMD-20, Pottorff SD-141, or approved equal.

2.7 TURNING VANES

- A. Fabricate turning vanes according to SMACNA HVAC Duct Construction Standards, Figures 4-3.
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch-wide, curved blades set at 3/4 inch) on center, support with bars perpendicular to blades set at 2 inches on center, and set into side strips suitable for mounting in ducts.

2.8 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. General: Provide construction and airtightness suitable for duct pressure class.
- B. Frame: Galvanized sheet steel. Provide with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized sheet metal construction with insulation fill and thickness, number of hinges and locks as indicated for duct pressure class. Provide vision panel where indicated. Provide 1-inch by 1-inch butt hinge or piano hinge and cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber seals.
- E. Insulation: 1-inch- thick fiber glass or polystyrene foam board.
- F. Access doors shall be Ruskin Model ADH-22, Kees ADH, Pottorff HAD, or approved equal.

- G. Access doors for oval and round ducts shall be constructed of 20 ga steel with neoprene gasket and hand knobs for access. Access doors shall be Ruskin Model ADR/ADF, Greenheck RAD, or approved equal.

2.9 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL Standard 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory-fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 1st Edition, Figure 2-19.

2.10 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts – Insulated (2.33", R-6): Factory-fabricated, insulated, round duct, with an outer aluminum jacket, glass fiber insulation around a continuous inner liner.
 - 1. Reinforcement: Steel-wire helix encapsulated in the inner liner.
 - 2. Outer Jacket: Glass-reinforced, silver mylar with a continuous hanging tab, integral fiber glass tape, and nylon hanging cord.
 - 3. Outer Jacket: Polyethylene film.
 - 4. Inner Liner: Polyethylene film for low pressure, woven glass fiber for high pressure.
 - 5. Medium pressure duct rated at 6" static pressure.
 - 6. Manufacturer: Therma-flex or approved equivalent.

2.11 ACCESSORIES HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket and a flat mounting gasket. Size to allow insertion of pilot tube and other testing instruments and provide in length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket, 1/4-inch, zinc-plated operating rod, and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless steel band with cadmium-plated hex screw to tighten band with a worm-gear action. Provide in sizes from 3 to 18 inches to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof and resistant to gasoline and grease.
- E. Provide all necessary transformers, electrical components suitable for each system installation including duct damper controllers, fire dampers and smoke dampers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of duct accessories. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.
- B. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.
- D. Install fire and smoke dampers according to the manufacturer's UL-approved printed instructions.
- E. Install fusible links in fire dampers.
- F. Label access doors for fire dampers indicating damper type (Fire Damper, Fire Smoke Damper, Smoke Damper).

3.3 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

END OF SECTION 23 33 00



SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Ceiling-mounted fans.
 - 2. In-line cabinet fans.
 - 3. Centrifugal inline fans.
 - 4. Centrifugal roof upblast fans.
 - 5. Centrifugal roof kitchen hood ventilator.
 - 6. Centrifugal sidewall fans

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
 - 2. Rated capacities, operating characteristics, and furnished specialties and accessories.
 - 3. Certified fan performance curves with system operating conditions indicated.
 - 4. Certified fan sound-power ratings.
 - 5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 6. Material thickness and finishes, including color charts.
 - 7. Dampers, including housings, linkages, and operators.
 - 8. Prefabricated roof curbs.
 - 9. Fan speed controllers.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For HVAC power ventilators to include in normal and emergency operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Loren Cook.

2. GREENHECK.
3. ACME
4. Loren Cook Company.
5. PennBarry.
6. Twin City.

2.2 CEILING-MOUNTED FANS

- A. Housing: Steel, lined with acoustical insulation.
- B. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel removable for service.
- C. Back-draft damper: Integral.
- D. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
 1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
 3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
 4. Motion Sensor: Motion detector with adjustable shutoff timer.
 5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless steel springs, and fusible link.
 6. Filter: Washable aluminum to fit between fan and grille.
 7. Isolation: Rubber-in-shear vibration isolators.
 8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.3 IN-LINE CABINET FANS

- A. Description: Square in-line centrifugal fans.
- B. Housing:
 1. Housing Material: Reinforced steel.
 2. Housing Coating: Hot-dip galvanized.
 3. Housing Construction: Side panels shall be easily removable for service. Include inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream; factory wired to disconnect switch located on outside of fan housing.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosures around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Centrifugal forward curved type, constructed of galvanized steel. Wheel

shall be balanced in accordance with AMCA Standard 204-05, Balance quality and vibration levels for fans.

- F. Motor Enclosure: Open, dripproof type with permanently lubricated bearings, built-in thermal overload protection and disconnect plug. Motor shall be provided at the scheduled voltage.
- G. Accessories:
 - 1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
 - 2. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 3. Companion Flanges: For inlet and outlet duct connections.
 - 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
 - 5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
 - 6. Side Discharge: Flange connector and attachment hardware to provide right-angle discharge on side of unit.

2.4 CENTRIFUGAL IN-LINE FANS

- A. Description: Square in-line centrifugal fans.
- B. Housing:
 - 1. Housing Material: Reinforced steel.
 - 2. Housing Coating: Hot-dip galvanized.
 - 3. Housing Construction: Side panels shall be easily removable for service. Include inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosures around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum airfoil blades welded to aluminum hub.
- F. Motor Enclosure: Totally enclosed, fan cooled NEMA Design B motor with Class B insulation. Motor shall be rated for continuous duty and furnished at the scheduled voltage and phase.
- G. Accessories:
 - 1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
 - 2. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 3. Companion Flanges: For inlet and outlet duct connections.
 - 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
 - 5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
 - 6. Side Discharge: Flange connector and attachment hardware to provide right-

angle discharge on side of unit.

2.5 CENTRIFUGAL ROOF UPBLAST FANS

- A. Configuration: Centrifugal roof upblast ventilator.
- B. Housing: Removable spun-aluminum dome top and outlet baffle; square, one-piece aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings; minimum ABMA9, L(10) of 100,000 hours.
 - 4. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
 - 5. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch for use with motors larger than 5 hp.
 - 6. Fan and motor isolated from exhaust airstream.
- E. Accessories:
 - 1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 - 5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
 - 6. Spark-resistant, all-aluminum wheel construction.
- F. Prefabricated Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 - 1. Configuration: Self-flashing without a cant strip, with mounting flange. Manufactured to accommodate roof slope.

2.6 CENTRIFUGAL ROOF KITCHEN HOOD VENTILATOR

- A. Housing: Removable spun-aluminum dome top and outlet baffle; square, one-piece aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
 - 2. Provide grease collector.

- B. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- C. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings; minimum ABMA9, L(10) of 100,000 hours.
 - 4. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
 - 5. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch for use with motors larger than 5 hp.
 - 6. Fan and motor isolated from exhaust airstream.
- D. Accessories:
 - 1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch mesh, aluminum, or brass wire.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 - 5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
 - 6. Spark-resistant, all-aluminum wheel construction.
 - 7. Mounting Pedestal: Galvanized steel with removable access panel.
 - 8. Restaurant Kitchen Exhaust: UL 762 listed for grease-laden air exhaust.
- E. Prefabricated Kitchen Exhaust Roof Curbs: Galvanized steel; mitered and welded corners; ventilation openings on all sides to ventilate curb interstitial space. Size as required to suit roof opening and fan base.
 - 1. Configuration: Self-flashing without a cant strip, with mounting flange manufactured to accommodate roof slope.
 - 2. Overall Height: 18 inches.
 - 3. Hinged sub-base to provide access to damper or as cleanout for grease applications.
 - 4. Pitch Mounting: Manufacture curb for roof slope.
 - 5. Metal Liner: Galvanized steel.
 - 6. Mounting Pedestal: Galvanized steel with removable access panel.
 - 7. Vented Curb: For kitchen exhaust; 12-inch-high galvanized steel; unlined, with louvered vents in vertical sides.
 - 8. NFPA 96 code requirements for commercial cooking operations.
 - 9. Kitchen Hood Exhaust: UL 762 listed for grease-laden air.

2.7 CENTRIFUGAL SIDEWALL FANS

- A. Configuration: Centrifugal sidewall ventilator.
- B. Housing: Removable spun-aluminum dome top and outlet baffle; square, one-piece aluminum base with venturi inlet cone.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings; minimum ABMA9, L(10) of 100,000 hours.
4. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
5. Motor Pulleys: Adjustable pitch for use with motors through 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions. Provide fixed pitch for use with motors larger than 5 hp.
6. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Frequency Motor Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum, or brass wire.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.
6. Spark-resistant, all-aluminum wheel construction.
7. Wall Mount Adapter: Attach wall-mounted fan to wall.

2.8 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.9 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. AMCA Certification: Fans shall comply with AMCA 11 and bear the AMCA-Certified Ratings Seal.

C. Fan Sound Ratings: Comply with AMCA 311, and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.

D. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.

E. Operating Limits: Classify according to AMCA 99.

- F. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

PART 3 - EXECUTION

3.1 INSTALLATION OF HVAC POWER VENTILATORS

- A. Install power ventilators level and plumb.
- B. Secure roof-mounted fans to roof curbs with zinc-plated hardware.
- C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- D. Support suspended units from structure using threaded steel rods and spring hangers with vertical-limit stops having a static deflection of 1 inch.
- E. Install units with clearances for service and maintenance.
- F. Label units with engraved aluminum nameplate. Nameplate shall include the make, model, date of installation, design CFM and static pressure.
- G. For fans installed on metal roofs, coordinate roof curb with the shape profiles of the roof panels. Provide custom color prefinished galvalume exterior cladding on the exterior or the roof curb. Coordinate color of the custom-colored cladding with the Architect.

3.2 DUCTWORK CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

3.3 ELECTRICAL CONNECTIONS

- A. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.

3.5 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain ventilator fans.

END OF SECTION 23 34 23

SECTION 23 37 13 – DIFFUSERS, REGISTERS, AND GRILLES



1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. Section Includes:
 - 1. Rectangular and square ceiling diffusers.
 - 2. Louver face diffusers.
 - 3. Linear bar diffusers.
 - 4. Linear slot diffusers.
 - 5. Adjustable bar, registers and grilles
 - 6. Eggcrate Grille with Filter Frames

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.
- C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.
- D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
 - a. Source quality-control reports.

2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat
 - ii. Krueger.
 - iii. METALAIR, Inc.
 - iv. Nailor Industries Inc.
 - v. Price Industries.
 - vi. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: White baked enamel, unless noted otherwise.
5. Face Size: See Plans.
6. Face Style: Three cone.
7. Mounting: Surface T-bar
8. Pattern: Fixed
9. Dampers: Radial opposed blade.

B. Louver Face Diffuser

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat
 - ii. METALAIR, Inc.
 - iii. Nailor Industries Inc.
 - iv. Price Industries.
 - v. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Custom color selected by Architect.
5. Face Size: See Plans.
6. Mounting: Surface and T-bar.
7. Pattern: Four-way core style.
8. Dampers: Radial opposed blade.
9. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Bar Diffuser

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat

- ii. Krueger.
 - iii. METALAIR, Inc.
 - iv. Nailor Industries Inc.
 - v. Price Industries.
 - vi. Titus.
- 2. Devices shall be specifically designed for variable-air-volume flows.
- 3. Material: Aluminum.
- 4. Finish: White baked enamel, unless noted otherwise.
- 5. Wide Core Spacing Arrangement: 1/8-inch thick blades spaced 1/2 inch apart, zero 15-degree deflection.
- 6. Wide Core Spacing Arrangement: 3/16-inch thick blades spaced 1/2 inch apart, zero 15 or 30-degree deflection.
- 7. Narrow Core Spacing Arrangement: 1/8-inch thick blades spaced 1/4 inch apart, zero 15degree deflection.
- 8. One-Way Deflection Vanes: Extruded construction fixed louvers with removable core.
- 9. Frame: 1- inches wide.
- 10. Mounting: Concealed bracket.
- 11. Damper Type: Adjustable opposed-blade assembly.

B. Linear Slot Diffuser:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat
 - ii. Krueger.
 - iii. METALAIR, Inc.
 - iv. Nailor Industries Inc.
 - v. Price Industries.
 - vi. Titus.
- 2. Devices shall be specifically designed for variable-air-volume flows.
- 3. Material - Shell: Aluminum, insulated.
- 4. Material - Pattern Controller and Tees: Aluminum.
- 5. Finish: White baked enamel, unless noted otherwise.
- 6. Number of Slots: as required or noted.
- 7. Length: See Plans.
- 8. Accessories: Plaster frame or T-bar slot.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat
 - ii. Krueger.
 - iii. METALAIR, Inc.
 - iv. Nailor Industries Inc.
 - v. Price Industries.
 - vi. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inches apart.
5. Core Construction: Removable.
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
7. Frame: 1 inch wide.
8. Mounting Frame: Filter
9. Mounting: Countersunk screw or Lay in.
10. Damper Type: Adjustable opposed blade.
11. Accessories:
 - a. Front-blade gang operator.

B. Adjustable Bar Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat
 - ii. Krueger.
 - iii. METALAIRE, Inc.
 - iv. Nailor Industries Inc.
 - v. Price Industries.
 - vi. Titus.
2. Material: Aluminum
3. Finish: White baked enamel, unless noted otherwise.
4. Face Blade Arrangement: Horizontal spaced 3/4 inches apart.
5. Core Construction: Integral
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
7. Frame: 1 inch wide.
8. Mounting: Countersunk screw or Lay in.

C. Eggcrate Grille with Filter Frames:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - i. Anemostat
 - ii. Krueger
 - iii. METALAIRE, Inc.
 - iv. Nailor Industries Inc.
 - v. Price Industries
 - vi. Titus
2. Material: Aluminum Grid and border with filter frame
3. Finish: White baked enamel, unless noted otherwise. Finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes.
4. Mounting: Countersunk screw
5. Return grilles must provide a free area of at least 90%.
6. Outer borders shall be constructed of heavy extruded aluminum with a thickness of 0.040-0.050 inch and shall have countersunk screw holes for a neat appearance.
7. Border width shall be 1¼ inches on all sides and shall be interlocked at the four corners and mechanically staked to form a rigid frame.

8. Aluminum grid shall be $\frac{1}{2}$ x $\frac{1}{2}$ x $\frac{1}{2}$ inch. Grille shall be provided with a filter frame for a standard 1-inch filter to fit the specified duct size.
9. The manufacturer shall provide published performance data for the grille.
10. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

2.4 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."

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 80 25 - DECENTRALIZED HVAC EQUIPMENT

PART 1 - GENERAL



1.1 SYSTEM DESCRIPTION

- A. The variable capacity, heat recovery air conditioning system shall be a Mitsubishi Electric CITY MULTI VRF / Daikin Emerion Series heat recovery system.
- B. The VRF/VRV system shall consist of an outdoor unit, BC (Branch Circuit) Controller/ BS Branch Selector, multiple indoor units, and NET DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

1.2 QUALITY ASSURANCE

- A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF/VRV systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
- E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendation.

1.4 CONTROLS

- A. **Controls system shall interface with existing campus-wide controls system to report all data back to the existing BAS controls system. Contractor shall coordinate BAS system type, manufacturer, and exact tie in location with owner.**
- B. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

- C. System controls and control components shall be installed in accordance with the manufacturer's written installation instructions.
- D. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
- E. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.
- F. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
- G. System shall be capable of email generation for remote alarm annunciation.
- H. Control system start-up shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in Mitsubishi/Daikin controls system configuration and operation. The representative shall provide proof of certification for Mitsubishi CMCN /Daikin Emerion Essentials Training and/or CMCN/Daikin Emerion Hands-On Training indicating successful completion of no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals. This service shall be equipment and system count dependent and shall be a minimum of one (1) eight (8) hour period to be completed during normal working hours.

PART 2 - WARRANTY

- 2.1 The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.
 - A. If the systems are:
 - 1. Designed by a certified CITY MULTI Diamond Designer/Daikin Emerion Designer.
 - 2. Installed by a contractor that has successfully completed the Mitsubishi Electric/Daikin Emerion service course, AND
 - 3. Verified with a completed commissioning report submitted to and approved by the Mitsubishi Electric /Daikin Service Department,
 - B. Then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.
 - C. In addition, the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation.
 - D. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.
 - E. This warranty shall not include labor.
 - F. Manufacturer shall have a minimum of twenty-nine years of HVAC experience in the U.S. market.

- G. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.
- H. The Mitsubishi CITY MULTI VRF /Daikin Emerion VRV system shall be installed by a contractor with extensive CITY MULTI/Daikin install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

PART 3 - PRODUCTS

3.1 OUTDOOR UNIT

- A. General:

The outdoor unit shall be used specifically with CITY MULTI VRF/Daikin Emerion VRV components. The outdoor units shall be equipped with multiple circuit boards that interface to the NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped, and wired and run tested at the factory.

 - 1. The model nomenclature and unit requirements are shown below. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
 - 2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
 - 3. Refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) / BS (Branch Selector) Controller (Single or Main) shall be insulated in accordance with the installation manual.
 - 4. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
 - 5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
 - 6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
 - 7. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
 - 8. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperatures or cooling mode down to 23°F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
 - 9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
 - 10. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend "no or reduced heating" periods shall not be allowed.
- B. Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized, and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models)

C. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant

1. R410A refrigerant shall be required for outdoor unit systems.
2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

F. Compressor:

1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
2. A crankcase heater(s) shall be factory mounted on the compressor(s).
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
4. The compressor will be equipped with an internal thermal overload.
5. The compressor shall be mounted to avoid the transmission of vibration.
6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

G. Controls:

1. The outdoor unit shall have the capability of up to 8 levels of demand control for each refrigerant system

H. Electrical:

1. The outdoor unit electrical power shall be 480 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 460-480 volts.
3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.2 BRANCH CIRCUIT (BC) CONTROLLERS FOR R2-SERIES SYSTEMS

A. General

1. The BC (Branch Circuit) Controllers / BS (Branch Selector) Controller shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no sub-cooling risk bubbles in liquid supplied to LEV and are not allowed.
2. The BC (Branch Circuit) Controllers/BS (Branch Selectors) Controllers shall be specifically used with Outdoor systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller/BS Branch Selector shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

B. BC Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.
2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
3. The unit shall house two tube-in-tube heat exchangers.

C. Refrigerant

1. R410A refrigerant shall be required.

D. Refrigerant valves:

1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
2. Each branch shall have multiple two-position valves to control refrigerant flow.
3. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

E. Integral Drain Pan:

1. An Integral drain pan and drain shall be provided

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz.
2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz).
3. The Controller shall be controlled by integral microprocessors.
4. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.3 WALL MOUNTED INDOOR UNIT

A. General:

1. The wall-mounted indoor unit section and shall have a modulating linear expansion device and a flat front. The unit shall be used with an outdoor unit and BC/BS Controller, outdoor unit. The unit shall support individual control using NET DDC controllers.

B. Indoor Unit

1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. All casings, regardless of model size, shall have the same white finish
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
3. There shall be a separate back plate which secures the unit firmly to the wall.

D. Fan:

1. The indoor fan shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

H. Controls:

1. This unit shall use controls provided by Mitsubishi Electric Cooling & Heating / Daikin Emerion to perform functions necessary to operate the system. Please refer to Part 4 of this guide specification for details on controllers and other control options.
2. The unit shall be able to control external backup heat.
3. The unit shall have a factory built in receiver for wireless remote control
4. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
5. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable dead band from set point.
6. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
7. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

3.4 (4-WAY CEILING-RECESSED CASSETTE WITH GRILLE) INDOOR UNIT

A. General

1. The four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Branch ducting shall be allowed from cabinet.

4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
5. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space

C. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
4. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
5. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
6. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.
7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

D. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space. Filter:

1. Return air shall be filtered by means of a long-life washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.
7. Both refrigerant lines to the PLFY indoor units shall be insulated in accordance with the installation manual.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

G. Controls:

1. This unit shall use controls provided by Mitsubishi Electric/Daikin Emerion to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

3.5 1-WAY CEILING-RECESSED CASSETTE WITH GRILLE INDOOR UNIT

A. General:

1. The one-way cassette indoor unit that recesses into the ceiling with a ceiling grille and shall have a modulating linear expansion device. The unit shall be used with the R2-Series outdoor unit and Controller. The unit shall support individual control using M-NET DDC controllers.

B. Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be space-saving ceiling recessed.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Branch ducting shall be allowed from cabinet.
4. The one-way grille shall be fixed to bottom of cabinet allowing for one-way airflow.

D. Fan:

1. The indoor fan shall be an assembly with one line-flow fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 23 inches above the condensate pan.
7. Both refrigerant lines to the PMFY indoor units shall be insulated in accordance with the installation manual.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

H. Controls:

1. This unit shall use controls provided by Mitsubishi Electric / Daikin Emerion to perform functions necessary to operate the system. Please refer to Part 5 of this guide specification for details on controllers and other control options.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable dead-band from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

PART 4 - CONTROLS

4.1 OVERVIEW

A. General:

1. The Controls Network shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®.

4.2 ELECTRICAL CHARACTERISTICS

A. General:

1. The Controls Network shall operate at 30VDC. Controller power and communications shall be via a common non-polar communications bus.

B. Wiring:

1. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
2. Control wiring for the remote controller shall be from the remote controller to the first associated indoor unit NET connection. The remote controller shall be assigned an NET address.

3. Control wiring for the Remote and Wireless remote controllers shall be from the remote controller (receiver) to the first associated indoor unit then to the remaining associated indoor units in a daisy chain configuration.
4. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
5. The centralized controller shall be capable of being networked with other centralized controllers for centralized control.

C. Wiring type:

1. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the System Builder output.
2. Network wiring shall be CAT-5 with RJ-45 connection.

4.3 CONTROLS NETWORK

A. The Controls Network consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces.

B. Backlit Remote Controllers

1. The Backlit Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group). The Backlit Remote Controller shall be compact in size, approximately 3" x 5" and have limited user functionality. The Backlit controller supports temperature display selection of Fahrenheit or Celsius. The Backlit Remote Controller shall allow the user to change on/off, mode (cool, heat, auto, dry, setback and fan), temperature setting, and fan speed setting and airflow direction. The Backlit Remote Controller shall be able to limit the set temperature range from the Backlit remote controller. The Backlit Remote controller shall be capable of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Backlit Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit Remote Controller shall display a four-digit error code in the event of system abnormality/error.
2. The Backlit Remote Controller shall only be used in same group with Wireless Remote Controllers or with other Backlit Remote Controllers, with up to two remote controllers per group.
3. The Backlit Remote Controller shall require no addressing. The Backlit Remote Controller shall connect using two-wire, stranded, non-polar control wire to connection terminal on the indoor unit. The Remote Controller shall require cross-over wiring for grouping across indoor units.

(Backlit Remote Controller)			
Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit. Auto and Setback mode are available for the R2/WR2-Series only.	Each Group	Each Group
Temperature Setting	Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit. Separate COOL and HEAT mode set points available depending on central controller and connected mechanical equipment.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group
Air Flow Direction Setting	PART 1Air flow direction settings vary depending on the indoor unit model.	PART 2Each Group	PART 3Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Display Backlight	Pressing the button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)	N/A	Each Unit
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit
Test Run	Operates air conditioner units in test run mode. *2 The display for test run mode will be the same as for normal start/stop (does not display “test run”).	Each Group	Each Group *2
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit.	Each Group	N/A
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group

4.4 CENTRALIZED CONTROLLER (WEB-ENABLED)

A. Centralized Controller

1. The Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. The Centralized Controller shall be approximately 7-1/2"x12" in size and shall be powered from a Power Supply Unit. The Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the

Centralized Controller shall include on/off, operation mode selection (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, and airflow direction setting. Since the centralized controller provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

(Centralized Controller)			
Item	Description	Operation	Display
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation) Operation modes vary depending on the air conditioner unit. Auto mode is available for certain series only.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 57°F – 87°F depending on operation mode and indoor unit.	Each Block, Group or Collective	Each Group
Set Temperature Range Limit	The range of room temperature setting can be limited by the initial setting. The lowest limit temperature can be made higher than the usual (67°F) in cool/dry mode, while the upper limit temperature lower than the usual (83°F) in heat mode.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group
Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can be scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group

(Centralized Controller)			
Item	Description	Operation	Display
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote-control function (Start/Stop, Change operation mode, Set temperature, Reset filter). Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group.	N/A	Each Group
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection.	N/A	*4 Each Unit or Collective
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation".	Each Group	Each Group
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese are available.	N/A	Collective
External Input / Output	By using accessory cables you can set and monitor the following. Input By level: "Batch start/stop", "Batch emergency stop" By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" Requires the external I/O cables sold separately.	*5 Collective	*5 Collective
Free Contact Interlock Control	Operation of indoor groups, general equipment or free contact outputs based on group(s) conditions or free contact(s) input states.	Each Group, Output or Collective	N/A

2. All Centralized Controllers shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN).
3. The Centralized Controller shall be capable of performing initial settings via the 9" high-resolution, backlit, color touch panel on the controller or via a PC using the Centralized Controller's initial setting browser.

- B. Standard software functions shall be available so that the building manager can securely log into each Centralized Controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Tenant Billing shall be available. The Tennant Billing function shall require Integrated System software in conjunction with Centralized Controllers. The power supply shall supply 24VDC for the centralized controller and 30VDC voltage for the central control transmission.

END OF SECTION 23 80 25



SECTION 23 80 50 – 100% DEDICATED OUTSIDE AIR SYSTEM

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

- A. The dedicated outside air system (DOAS) shall be a Mitsubishi Electric CITY MULTI VRF System / Daikin VRV-IV-X. The DOAS shall be provided with the capability to reheat air using recovered energy from the primary cooling coil or provide a primary cooling coil only. The DOAS shall be of a split system type.
- B. The DOAS reheat system shall consist of a 10 ton modular outdoor unit, 6 port minimum BC (Branch Circuit) Controller, indoor unit, and NET based controller. System shall be capable of automatically determining mode necessary to provide required air conditions with no interruption to system operation except for defrost operation. The system shall only consist of one indoor unit per outdoor unit.
- C. The DOAS non-reheat system shall consist of 10 ton modular outdoor unit, indoor unit, and NET based controller. System shall be capable of automatically determining mode necessary to provide required air conditions with no interruption to system operation except for defrost operation. The system shall only consist of one indoor unit per outdoor unit.

1.2 QUALITY ASSURANCE

- A. The units shall be listed by Electrical Test Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- D. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.
- E. System shall be composed of components which meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendation.

1.4 WARRANTY

- A. The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.
- B. If the systems are:
 - 1. Designed by a certified VRF/VRV Designer,
 - 2. installed by a contractor that has successfully completed the Mitsubishi Electric three-day service course, AND
 - 3. verified with a completed commissioning report submitted to and approved by

Mitsubishi/Daikin Service Department,

- C. then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation.
- D. In addition, the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation.
- E. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.
- F. This warranty shall not include labor.
- G. Manufacturer shall have a minimum of thirty years of HVAC experience in the U.S. market.
- H. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.
- I. The VRF/VRV system shall be installed by a contractor with an extensive install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

PART 2 - PRODUCTS

2.1 OUTDOOR UNIT

- A. General:
 - 1. The reheat DOAS shall be used specifically with the outdoor unit using VRF/VRV components. The outdoor units shall be equipped with multiple circuit boards that interface to the NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
 - 2. Outdoor unit shall have a sound rating no higher than 60 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
 - 3. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated in accordance with the installation manual.
 - 4. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
 - 5. The outdoor unit shall have a high-pressure safety switch, over-current protection, crankcase heater and DC bus protection.
 - 6. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
 - 7. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
 - 8. The outdoor unit shall not cease operation in any mode based solely on outdoor ambient temperature.
 - 9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
 - 10. Unit must defrost all circuits simultaneously in order to resume full heating more

quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.

B. Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models)

C. Fan:

1. Each outdoor unit module shall be furnished with one or two direct drive, variable speed propeller type fan(s). The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant

1. R410A refrigerant shall be required for outdoor unit systems.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

F. Compressor:

1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non-inverter driven compressors shall not be allowed.
2. A crankcase heater(s) shall be factory mounted on the compressor(s).
3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 18% of rated capacity.
4. The compressor will be equipped with an internal thermal overload.
5. The compressor shall be mounted to avoid the transmission of vibration.

G. Electrical:

1. The outdoor unit electrical power shall be 208/230 or 460 volts, 3-phase, 60 hertz.
2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz) or 414-506V (460V/60Hz).
3. The outdoor unit shall be controlled by integral microprocessors.
4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.2 BRANCH CONTROLLERS/SELECTORS FOR DOAS SYSTEMS

A. General:

1. The controllers shall be specifically used with R410A VRF/VRV systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The controller/selector shall be completely factory assembled, piped
2. and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors,
3. with access and service clearance provided for each controller. The DOAS Controller/Selector shall be connected to only one indoor unit, the DOAS indoor unit. The Controller shall be suitable for use in plenums in accordance with UL1995 ed

B. BC/BS Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.
2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
3. The unit shall house two tube-in-tube heat exchangers.

C. Refrigerant

1. R410A refrigerant shall be required.
2. Refrigerant Branches
3. All controller/selector refrigerant pipe connections shall be brazed or flared.

D. Refrigerant valves:

1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH. Branches may be twinned to allow more than 54,000 BTUH.
2. Each branch shall have multiple two-position valves to control refrigerant flow.
3. Service shut-off valves shall be field-provided/installed for each branch.
4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

E. Integral Drain Pan:

1. An integral resin drain pan and drain shall be provided.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
3. The controller/selector shall be controlled by integral microprocessors.
4. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.3 DUCTED INDOOR UNIT

A. General:

1. The Reheat unit shall be a ducted indoor fan coil that mounts where needed with a fixed rear return and a horizontal discharge supply, primary and reheat coil, and three modulating linear expansion devices. The unit shall be used with the VRF/VRV outdoor unit and Controller/Selector to create a DOAS. The unit shall support individual control using NET DDC controllers. The unit shall feature external static pressure settings up to 0.96 in. WG, depending on voltage. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

B. Indoor Unit.

1. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, primary cooling coil, reheat coil, temperature and humidity sensors, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be ducted on both the supply and return
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:

1. The indoor unit fan shall be an assembly with two Sirocco fan(s) direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter:

1. Outside air shall be filtered by a field-supplied filter. Unit shall have sufficient external static pressure to operate with a MERV-13 filter installed.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. A condensate lift mechanism shall be factory installed capable of providing up to 21-11/16" of lift.
7. All refrigerant lines to the indoor units shall be insulated in accordance with the - installation manual.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

H. Controls:

1. This unit shall use controls provided by Mitsubishi /Daikin to perform functions necessary to operate the system.

PART 3 - OPERATION

3.1 DEDICATED OUTSIDE AIR SYSTEM WITH REHEAT CAPABILITY:

A. General:

1. The DOAS reheat system shall be rated at 87° F DB/80° F WB in cooling for both the outdoor unit and indoor unit entering air conditions. Heating rating point shall be 32° F DB/28° F WB for the outdoor unit and 32° F DB indoor unit entering air conditions.

B. System operation parameters:

1. The system shall operate with intake air temperature ranging from -4° F WB up to 95° F WB.
2. The unit shall be capable of intake of unmixed or untreated -4° F WB air directly to the primary coil.
3. The unit shall be capable of providing active coil operation in cooling mode down to 50° F WB.
4. In a cooling condition, the system shall be capable of providing supply air for downstream use within the following specifications at rated conditions

Operation Type	Minimum Leaving Air Condition		Maximum Leaving Air Condition	
	Degrees F, Dry Bulb	Degrees F, Wet Bulb	Degrees F, Dry Bulb	Degrees F, Wet Bulb
Cooling Only, No Reheat	50	50	60	60
Cooling Mode with Reheat	63	51.5 (45% RH)	83	67.5 (45% RH)
1. Cooling Only, No reheat uses only primary cooling coil. Leaving air temperature can be chosen between 50 and 60 deg F in one degree increments. 2. Cooling mode with reheat uses both primary cooling coil and reheat coil. Leaving air temperature from reheat coil can be chosen between 63 and 83 deg F in one degree F dry bulb increments along a line of 45% constant relative humidity.				

5. In heating mode, the system shall be capable of providing 78° F DB supply air at rated conditions.

END OF SECTION 23 80 50

SECTION 26 00 01 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions as appropriate, apply to the Work specified in this Section.
- B. Refer to all Electrical Divisions of the Specifications as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

1.2 BIDDING REQUIREMENTS AND RESPONSIBILITIES

- A. Prime bidder is responsible for all work, of all trades and sub-contractors bidding this project. It is the prime bidder's responsibility, prior to submitting a bid to ensure that sub-contractors coordinate all aspects of the work between trades, sub-contractors, etc. to the fullest extent possible.
- B. Prime bidder shall ensure that all sub-contractors, suppliers, equipment vendors, etc., obtain all necessary and pertinent contract document information pertaining to their work prior to the submission of a bid. Contractor shall realize that different sub-contractors may furnish equipment, accessories, devices, etc. necessary for a complete and working installation, that require provision of services by another sub-contractor or trade.
- C. Bidders of all or any portions of this section or division are required to review all contract documents including but not limited to Architectural drawings, Structural drawings, Mechanical drawings, Plumbing drawings, Electrical drawings, etc. to coordinate requirements and responsibilities with and through prime bidder.
- D. Bidders of all or any portions of this section or division, by furnishing a bid on a portion of the prime contract are indicating that they have received all contract documents and coordinated services provided under their portion of the work with the prime bidder; they are indicating that they have expressed any pertinent questions (which would result from a detailed, thorough review of the entire set of contract documents) to the prime bidder in accordance with the general provisions of the Specifications requirements, prior to bidding.
- E. All timely, pertinent, questions provided in writing prior to bids, in accordance with the general provisions of the Specifications requirements, will be clarified, defined, or otherwise explained in a written addendum and/or addendums prior to bids, in accordance with the general provisions of the Specifications requirements.
- F. It is not the intention of these contract documents to leave any issue relating to coordination between trades or sub-contractors vaguely defined. The intention is to define all issues, coordination matters, equipment requirements, sizes, routing, etc. to the satisfaction of the prime bidder, prior to receipt of bids.
- G. Bidders of all or any portions of this section or division, by virtue of the submission of a bid to the prime bidder, are indicating that they have reviewed the entire set of contract documents with due diligence and regard for the Owner's desire for a comprehensive and complete bid proposal; that they have expressed all concerns or questions requiring clarification on matters of coordination between trades and/or sub-contractors; that they have expressed any such concerns or questions in writing in accordance with contract document's General Provisions requirements.



- H. Prime bidders, by submission of a comprehensive bid on the project are indicating that the subcontractors selected in their bid have complied with all contract document's General Provisions requirements, that they have indicated in writing, prior to bidding, all questions or concerns requiring clarification and/or explanation and have documented any and all specific exclusions involving work that would generally be considered to be work of their trade. The prime bidder shall coordinate all work so that anything excluded by the bidder of all or any portions of this section or division, have been addressed prior to bids in one of the following manners:
1. The work has been confirmed, by the prime bidder, to be work of another trade or subcontractor whose proposal is also being accepted.
 2. Clarification of the matter has been made through the prime design professional via written addendum and is clearly and mutually understood by the prime bidder and the party raising the issue/question or seeking clarification.
 3. The work has been accepted as the responsibility of the prime contractor directly.

1.3 MATERIAL AND EQUIPMENT

- A. The term "provide" when used in the Contract Documents includes all items necessary for the proper execution and completion of the work.
- B. Specific reference in the Specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgement of the Architect expressed in writing is equivalent to that specified.
- C. Coordinate and properly relate all work of this Division to building structure and work of all other trades.
- D. Visit premises and become thoroughly familiar with existing conditions; verify all dimensions in field. Advise Architect of any discrepancies prior to Bid Date in accordance with contract document's General Provisions.
- E. Do not rough-in for any item or equipment furnished by others or noted "Not in Contract" (NIC), without first receiving rough-in information or determining rough-in requirements from other trades and/or Architect.
- F. Provide storage and protection for all equipment and materials in accordance with requirements of contract document's General Provisions. Replace any equipment and materials damaged by improper handling, storage, or protection, at no additional cost to the Owner.
- G. Keep premises clean in accordance with requirements of contract document's General Provisions.

1.4 SUBSTITUTIONS

- A. Substitutions are allowed under La. R.S. 38:2291 and La R.S. 38:2292. Any requests for prior approval (as provided for under La. R.S. 38:2295) including any re-submitted data, shall be received by the Architect/Engineer a minimum of ten (10) working days prior to bid date. Submittals sent via facsimile and/or electronic mail will not be accepted. The Contractor shall recognize that it may be necessary to submit certain requests for prior approval sooner than the final date listed in the Instructions to Bidders, depending upon the complexity and completeness of the submittal. If, in the opinion of the

Architect/Engineer, there is neither sufficient time available nor adequate descriptive data attached to the submittal, the submittal will not be considered. Except as otherwise specified, materials and equipment shall be new and bear the approval label of the Underwriters Laboratories, Inc. for the type of installation required.

- B. Basis of design of systems is based on specific equipment for performance, size, shape, color, construction material, etc... If the use of other manufacturer's equipment, even though approved by Architect, involves additional cost due to space requirements, foundation requirements, increased mechanical or electrical services, the cost of such extra work shall be borne by the contractor. Even though a manufacturer's name appears in the Contract Documents as having acceptable equipment, his equipment shall be classified as being a substitute to the equipment originally designed for and named in the Contract Documents. Substitute equipment, materials, etc., will not be allowed to deviate from basis of design requirements.
- C. All requests for prior approval shall identify where proposed material matches or exceeds the performance of the equipment specified. In addition, such submittal shall also clearly identify all deficiencies compared to specified product. Submittal of general cut sheets will be returned rejected.
- D. The following items shall be submitted for prior approval:
 - 1. Lighting Fixtures
 - 2. Electrical Gear (Panelboards, Transformers, Safety Switches, Circuit Breakers, Contactors/Relays). This includes Short-Circuit Study, Coordination Study and Arc-Flash Study.
 - 3. Dimmer Switches
 - 4. Fire Detection and Alarm System
 - 5. Receptacles
 - 6. Toggle Switches
 - 7. Wiring Device Box Support Brackets
 - 8. Photocells
 - 9. Tele/Data Systems
 - 10. Cover Plates
 - 11. Pull Boxes
 - 12. Wire
 - 13. Occupancy/Motion Sensors
 - 14. Dimming Systems/Lighting Control Systems
 - 15. Time Clocks System
 - 16. Un-Interruptible Power Supplies (UPS)
 - 17. Floor Boxes
 - 18. Transient Voltage Surge Suppressors (TVSS)/Surge Protective Devices (SPDs)
 - 19. Audio/Visual System
 - 20. Lighting Emergency Battery Packs
 - 21. Lighting System Generator Transfer Devices (GTDs)

1.5 DRAWINGS AND SPECIFICATIONS

- A. The specific intent of these Contract Documents is to provide the various systems, equipment, etc. to the Owner complete and in a thoroughly calibrated and functional condition.
- B. The Drawings shall not be construed as shop drawings. In the event of a possible interference with piping or equipment of another trade, items requiring set grade and elevations shall have precedence over other items. Should any major interference develop, immediately notify the Architect.

- C. In laying out Work, refer to mechanical, electrical, structural, and architectural drawings at all times in order to avoid interference and undue delays in the progress of the Work.

1.6 CODES AND REGULATIONS

- A. Work shall be in full accord with the LA Sanitary Code, 2020 N.E.C. (NFPA 70), local ordinances, building codes, and other applicable national, state, and local regulations.
- B. Equipment shall conform to requirements and recommendations of the National Bureau of Fire Underwriters and National Fire Protection Association (NFPA).
- C. Items provided under this Division shall comply with the American National Standards Institute (ANSI) "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People," ANSI A 117.1, and the Americans with Disabilities Act (A.D.A.).
- D. Work called for in these Plans and Specifications shall be executed by competent workmen.
- E. In the possible event of conflict between codes or regulations and Contract Documents, notify the Architect/Engineer immediately.
- F. The drawings show approximate locations only of feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect reserves the right to make reasonable changes in locations indicated, before roughing-in, without additional cost to the Owner.
- G. Because of the small scale of the drawings, it is not possible to indicate all of the offsets, fittings, and accessories required. The Contractor shall investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions at no additional costs to the Owner.

1.7 FEES, PERMITS, AND TAXES

- A. Obtain and pay for permits required for the Work of this Division. Pay fees in connection therewith, including necessary inspection fees.
- B. Pay any and all taxes levied for Work of this Division, including municipal and/or state sales tax where applicable.

1.8 MANUFACTURER'S DIRECTIONS

- A. Install and operate equipment and material in strict accord with manufacturer's installation and operating instructions. The manufacturer's instructions shall become part of the Contract Documents and shall supplement Drawings and Specifications.

1.9 SUBMITTAL DATA

- A. Submit shop drawings, project data, and samples in accordance with requirements of the General Provisions of the contract documents. Submittals shall be received no later than thirty (30) consecutive calendar days from effective date of "Notice to Proceed".
- B. Shop drawings shall consist of published ratings or capacity data, detailed construction drawings for fabricated items, wiring and control diagrams, performance curves, installation

instructions, manufacturer's installation drawings, and other pertinent data. Submit drawings showing revisions to equipment layouts due to use of alternate or substitute equipment.

- C. Where manufacturers and suppliers of equipment, materials, etc. are unable to fully comply with Contract Document basis of design requirements, specifically call such deviations to attention of Architect/Engineer on submittals. Typed deviations on a separate sheet; underlined statements or notations on standard brochures, equipment fly sheets, etc. will not be accepted. Submittals shall clearly indicate where material submitted meets and/or exceeds the performance criteria of the equipment used as the basis of design of the project. Failure to note compliance with the basis of design material/equipment shall result in rejection of submittals.
- D. Approval of submittals shall not relieve Contractor from furnishing required quantities and verifying dimensions. In addition, approval shall not waive original intent of Contract Documents.
- E. Failure to obtain written approval of equipment shall be considered sufficient grounds for rejection of said equipment regardless of the stage of completion of the project.
- F. Contractor shall submit Submittals/Shop Drawings on all equipment listed below. In addition, contractor shall refer to subsequent sections of the Electrical portion of the specifications for additional shop drawing submittal requirements.
 - 1. Lighting Fixtures
 - 2. Electrical Gear (Panelboards, Transformers, Safety Switches, Circuit Breakers, Contactors/Relays). This includes Short-Circuit Study, Coordination Study and Arc-Flash Study.
 - 3. Dimmer Switches
 - 4. Fire Detection and Alarm System
 - 5. Receptacles
 - 6. Toggle Switches
 - 7. Wiring Device Box Support Brackets
 - 8. Photocells
 - 9. Tele/Data Systems
 - 10. Cover Plates
 - 11. Pull Boxes
 - 12. Wire
 - 13. Occupancy/Motion Sensors
 - 14. Dimming Systems/Lighting Control Systems
 - 15. Time Clocks System
 - 16. Un-Interruptible Power Supplies (UPS)
 - 17. Floor Boxes
 - 18. Transient Voltage Surge Suppressors (TVSS)/Surge Protective Devices (SPDs)
 - 19. Audio/Visual System
 - 20. Lighting Emergency Battery Packs
 - 21. Lighting System Generator Transfer Devices (GTDs)
- G. Shop drawings may be submitted electronically as described below.
 - 1. Must be in a portable document format (PDF).
 - 2. Must be submitted to the prime designer and the prime designer will forward to ADG Engineering for distribution/processing.
 - 3. Do not submit directly to ADG Engineering's project manager.

- H. Shop Drawings/submittals shall be submitted as grouped together and stated below and shall be submitted simultaneously. Electrical gear shop drawings shall not be submitted until approval is obtained for all HVAC and plumbing equipment. Prior to submission of electrical gear shop drawings, contractor shall obtain a copy of the approved mechanical and plumbing submittals. Any modifications required to be made to the electrical gear due to changes in electrical requirements (increases and/or decreases) of the mechanical and plumbing equipment shall be clearly notated in the electrical gear submittals.
1. Light Fixtures, Occupancy/Motion Sensors, Poles, Photocells, Dimming Systems/Lighting Control systems, Generator Transfer Devices (GTDs), Emergency Battery Packs
 2. Electrical Gear, Overcurrent Protective Device Studies
 3. Tele/Data Systems
 4. Fire Detection and Alarm System
 5. Dimmer Switches, Receptacles, Toggle Switches, Cover Plates, Device Box Support Brackets, Pull Boxes, Floor Boxes, and Wire
 6. Transient Voltage Surge Suppressors (TVSS)/Surge Protective Devices (SPDs)
 7. Audio/Visual System

1.10 PROJECT COORDINATION

- A. Refer to applicable Electrical Specification Sections for products work of this Division.
- B. Refer to all plumbing, mechanical and fire protections specifications sections for related products affecting work of these electrical sections.
- C. Coordinate handling of all products, materials, etc., through the Contractor. Coordinate space, access, clearances, etc., through the Contractor prior to preparation of shop drawing submittal.
- D. The Contractor is herein cautioned to note that the work involved is a complicated new addition project requiring continuous owner occupancy. The Contractor should review the phasing plans/descriptions and visit the project site to determine existing conditions. The Contractor will be held responsible for allowing for these conditions in his bid.

1.11 SERVICE CONTINUITY

- A. At all times during the construction of the project, electric service shall be maintained to all portions of the site and existing facility, except with prior written approval from the Architect/Engineer of interruptions. It shall be the responsibility of the contractor to provide, install and maintain (fuel included) any required rental generators to accomplish said task. Any required interruptions of electric service due to work being performed under this Contract shall be scheduled in writing a minimum of forty-eight (48) hours in advance after consultation with the Architect/Engineer and the Owner and shall occur when permitted by the Architect/Engineer. The Contractor shall be responsible for any overtime pay required to meet these requirements, at no additional cost to the Owner.

1.12 VALUE ENGINEERING (V/E):

- A. While it may be in the Owner's interest to consider the first cost money saving that may be generated via alternatives and options generated via participation in Value Engineering, contractor shall realize that substantive offers of Value Engineering (V/E), if accepted by the Owner, constitute a design-build agreement (offer and acceptance) with the owner, and drastically change the design concept of the project, as developed by the Professional of Record identified on the Contract Documents.

- B. Should contractor offer, and the owner accept value engineering options that alter aspects of the system design, equipment, performance and/or performance verification or monitoring of respective systems, the contractor shall provide duly licensed professional engineering consultants working on behalf of the contractor (including sub-contractors and equipment vendors/manufacturers) to review, approve and take professional responsibility for performance and suitability of V/E hybrid systems, materials or operational changes related to respective V/E items. The contractor's licensed professional engineering consultants and the contractor assume any and all responsibility for the design and suitability in terms of performance, of hybrid systems installed, as contractor's Professional of Record, absolving the original project Professional of Record (identified on the original Contract Documents, released for the original project Bid/Negotiation) from responsibility for the V/E hybrid systems portion of the work.
- C. The contractor, via the offer and acceptance of value engineering items on the project agrees to provide professional engineering design services and take full and complete responsibility for the hybrid design. Further, the contractor's (V/E Items) professional of record (either employees, or independent consultants to the contractor) through the offer and acceptance of V/E items, agree to indemnify and hold harmless the project owner, the owner's original A/E team (Professional of Record on behalf of the owner for the original Contract Documents) their heirs and assigns in regard to the V/E changes and their impact on the systems altered, affected or modified, in whole or in part. The Professional of Record shown on the original Contract Documents in regard to the systems altered, adjusted, revised, modified or otherwise affected by the value engineering items implemented, shall be absolved of design responsibility as a result of implementation of V/E items, and their original use of Engineering Seals used for original Contract Documents, shall not apply.
- D. Contractor shall refer to subsequent specification sections for additional requirements for submission and approval of VE items.

1.13 PROJECT RECORD DOCUMENTS

- A. Keep Project Record Documents in accordance with general provision requirements of the specifications.
- B. During construction period, keep accurate records of installations paying particular attention to major interior and exterior underground and concealed piping, ductwork, etc.
- C. The Contractor shall obtain a minimum of one (1) set of the contract documents including all addenda and change orders (including CAD/Revit files) as prepared by the Architect/Engineer.
- D. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect/Engineer for any phase of the work, he shall record in a neat and readable manner all such variances on the contract documents in red ink. Prior to requesting substantial completion, the marked-up set of contract documents shall be returned to the Architect/Engineer for approval.
- E. All deviations from sizes, locations and from all other features of the installation shown in the Contract Documents shall be recorded.
- F. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions, and the like, as well as other features of work which will be concealed underground and/or in the finished building.

- G. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc. and by properly referenced centerline or invert elevations and rates of fall.
- H. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases, this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The decision of the Architect/Engineer in this matter will be final.
- I. The following requirements apply to all Record Drawings:
 - 1. They shall be maintained at the Contractor's expense.
 - 2. All such drawings shall be done carefully and neatly.
 - 3. Additional drawings shall be obtained at the Contractor's expense.
 - 4. They shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/ Engineer and when necessary, by other trades, to establish clearances for other parts of the work.
 - 5. Record Drawings shall be returned to the Architect/Engineer upon completion of the work and are subject to approval of the Architect/ Engineer.
 - 6. CAD/Revit files can be provided upon request (proper release forms must be completed). Contractor shall update CAD/Revit files to reflect As-Built conditions and shall submit revised file back to Architect/Engineer as part of the close-out documents.

1.14 OPERATION AND MAINTENANCE DATA

- A. Refer to the specification Sections related to PROJECT CLOSEOUT or OPERATION AND MAINTENANCE DATA for procedures and requirements for preparation and submittal of maintenance manuals.
- B. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.
- C. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS.
- D. This information shall be bound in plastic hardbound notebooks with the job name, Architect and Engineer names permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.
- E. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.
- F. As part of the O & M binders, contractor shall include copies of all studies and test reports performed as part of this project, including but not limited to, the following:
 - 1. Acceptance Testing Reports
 - a. Grounding Tests
 - b. Thermographic Tests
 - c. Equipment Tests
 - d. Torque Values
 - e. Rotation Tests

2. Fire Alarm System 100% Test Report
 3. UPS System Start-up Tests
 4. Short Circuit Study Report – Updated to Reflect Installed Conditions
 5. Coordination Study Report – Updated to Reflect Installed Conditions
 6. Tele/Data system testing report(s)
 7. All specified photos of installations including open trenches, grounding terminations, pole foundation rough-ins, etc...
- G. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract including but not limited to those items listed below.
1. Lighting Fixtures
 2. Electrical Gear (Panelboards, Transformers, Safety Switches, Circuit Breakers, Contactors/Relays). This includes Short-Circuit Study, Coordination Study and Arc-Flash Study.
 3. Dimmer Switches
 4. Fire Detection and Alarm System
 5. Receptacles
 6. Toggle Switches
 7. Wiring Device Box Support Brackets
 8. Photocells
 9. Tele/Data Systems
 10. Cover Plates
 11. Pull Boxes
 12. Wire
 13. Occupancy/Motion Sensors
 14. Dimming Systems/Lighting Control Systems
 15. Time Clocks System
 16. Un-Interruptible Power Supplies (UPS)
 17. Floor Boxes
 18. Transient Voltage Surge Suppressors (TVSS)/Surge Protective Devices (SPDs)
 19. Audio/Visual System
 20. Lighting Emergency Battery Packs
 21. Lighting System Generator Transfer Devices (GTDs)

1.15 EXCAVATING AND BACKFILLING

- A. Provide excavating and backfilling necessary for Work of this Division. Comply with provisions of specification section pertaining to Site Work, if applicable.
- B. Trenches shall be inspected by Code Authorities and/or Owner's Representative before and after piping is laid. Give Owner's Representative 24-hour notice for each inspection. If any trenches are filled without Owner's Representative and/or authority having jurisdiction inspection and as subsequently found to be deficient, the trenches shall be uncovered, inspected, and then re-filled, if requested by Owner's Representative. Prior to covering any and all underground facilities, including but not limited to conduit, ground rods, terminations, etc., Contractor shall take clear and concise digital photos and shall forward said photos to Engineer prior to covering said utilities.
- C. Provide minimum 24 inches of cover to finish grades or paving at raceways.
- D. Protect and maintain trenches in dry condition until piping has been inspected and approved. Immediately after approval, backfill trenches in tamped layers. Repeat backfill

and tamping 6 months after initial coverage has been accomplished to avoid swale development from sinking soils.

- E. Compact fill to satisfaction of Architect and/or Owner's Representative.
- F. Prior to any excavating, Contractor shall be responsible for having all utilities in the area of excavation located and marked by an approved company with a minimum of five (5) years' experience locating underground facilities. This includes all owner owned utilities on their site.
- G. Approximate locations shown on the drawings shall not be used. Any facility damaged by the Contractor's underground work shall be repaired and/or replaced at no additional cost to the Owner

1.16 CUTTING AND PATCHING

- A. Comply with requirements of the Specifications regarding cutting and patching. Locate and timely install sleeves as required to minimize cutting and patching.
- B. Cutting, fitting, repairing, patching, and finishing of Work shall be done by craftsmen skilled in their respective trades. Where cutting is required, cut in such a manner as not to weaken structure, partitions, or floors. Holes required to be cut must be cut or drilled without breaking out around the holes. Where patching is necessary in finished areas of the building, the Architect will determine the extent of such patching and refinishing.
- C. Repairing Roadways and Walks: Where this contractor cuts or breaks roadways or walks to lay the piping, he shall repair or replace these sections to match existing, unless specifically identified as the responsibility of others.

1.17 PAINTING

- A. Painting shall be provided under the Specification section regarding painting, unless specified otherwise. Leave exposed piping, materials, and equipment clean and free of rust, grease, dirt, etc. before and after painting.
- B. Factory finished equipment, fixtures, and materials which are marred, chipped, scratched, or otherwise unacceptable shall be repaired or replaced under this Division to Architect satisfaction, at no additional cost to Owner.
- C. Coordinate all painting requirements with prime bidder prior to bids.
- D. All exposed conduit, materials, hangers, anchors, etc., are to be primed and painted. Color shall match adjacent surfaces where not specifically designated otherwise. All galvanized materials shall be suitably treated prior to painting to ensure adhesion.
- E. All exterior electrical gear (panels, meter cans, CT can, switchboards, safety switches, etc.) shall be painted to match adjacent wall surface(s). All interior panels (flush mount) shall have their covers painted to match adjacent wall surface(s).
- F. All exterior receptacles, junction boxes, speakers, trumpets, shall be painted to match adjacent wall surface(s).

1.18 EXISTING CONDITIONS

- A. The Electrical Contractor shall visit the building site to determine existing conditions and will be held responsible for allowing for these conditions in his bid.

- B. Note that this area of work will have storm drainage, mechanical and electrical utilities located underground and within and under the buildings. It is part of this work for the Contractor to determine the scope and location of all utilities to be installed with this project and arrange his work around others. There will be no extra consideration for work discovered as being hidden after the bid, and no change orders for extra cost that may be caused by unknown after bid conditions. The drawings show approximate locations only of feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Architect reserves the right to make reasonable changes in locations indicated, before roughing-in, without additional cost to the Owner.

1.19 PROTECTION OF APPARATUS

- A. The Contractor shall take precautions necessary at all times to properly protect his apparatus from damage. Failure on the part of the Contractor to comply with the above to the Architect's satisfaction shall be sufficient cause for the rejection of the particular piece of apparatus in question.

1.20 MINOR DEVIATIONS

- A. The Contractor shall realize that the drawings cannot delve into every step, sequence, or operation necessary for the completion of the project without drawing on the Contractor's experience. Only typical details are shown on the plans. In cases where the Contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.

1.21 SALVAGED MATERIALS

- A. The Owner shall have priority for the selection of salvaged material and equipment. Any equipment, light fixtures, devices, ballasts, materials, etc. selected to remain property of the Owner shall be removed and delivered to a location on the site as designated by the Owner. Material and equipment not retained by the Owner shall become the property of this Contractor and shall be removed from the site by him.
- B. The Contractor shall obtain written approval of all material and equipment determined not to be salvaged by the Owner.

1.22 SAFETY PRECAUTIONS

- A. Work methods and project safety are the Contractor's sole responsibility.
- B. Contractor shall furnish and place proper guards for prevention of accidents. He should provide and maintain any other necessary construction required to secure safety of life or property, including maintenance of sufficient lights during all day and night hours as required to secure such protection.
- C. Temporary electrical services during construction should be maintained in perfect condition. Frayed, loose or opened connections should not be used for temporary services. The Contractor should use only equipment in first class working condition for construction services.

1.23 TEMPORARY CONSTRUCTION LIGHTING

- A. The Contractor should provide and install construction lighting as required by General Contractor and other trades. The installation shall conform to requirements of the National Electrical Code.

1.24 SUPERVISION

- A. Contractor shall personally, or through an authorized and competent representative, constantly supervise the work done from beginning to completion and final acceptance. To the best of his ability, he shall keep the same foreman and workmen throughout the project duration. Foreman shall be present at project site at all times while work under this section of the contract documents is being performed. Foreman shall be accessible by cellular phone at all times. Respective telephone numbers shall be forwarded to Architect/Engineer prior to commencement of work on this project.

1.25 CAD/REVIT FILES

- A. ADG will provide, upon request, CAD/Revit files to the contractors for use in preparing submittals and record drawings. Plans will be provided at a cost of \$10.00 per drawings sheet requested. By submitting request for CAD/Revit files, contractors automatically consent to the verbiage contained in the CAD/Revit release form contained in the plans. This includes any all limitations, restrictions, indemnifications, etc... contained therein.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Panelboards, safety switches, equipment cabinets, motor starters and other equipment shown on the drawings and furnished and/or installed under this section of the Specifications shall be labeled with laminated plastic nameplates inscribed to identify equipment with description shown on the drawings for panels, the name of the equipment controlled for motor starters, or the system or function involved for other equipment. Provide typewritten panelboard directories indicating the equipment served and its location using final approved room numbers, etc., as directed by the Architect. Refer to specification section – Electrical Distribution System and details(s) for additional requirements.

PART 3 - EXECUTION

3.1 COORDINATION OF TRADES

- A. Where work is in close proximity to the work of other contractors, the Contractor shall review plans of other contractors and coordinate his work with theirs. The Electrical Contractor shall verify the location of lighting fixtures, beams, structural members, conduit, ductwork, pipes or other obstructions before beginning his work in the area. Notify the Architect where proper clearances do not occur or where the work of others would interfere with the safe and/or proper operation of this work.

3.2 HARMONIC DISTORTION

- A. IEEE 519-1992 - Harmonic Control in Electrical Power Systems shall be a requirement of this project. Harmonic filters (passive or active), phase multiplication devices, or any other components required to mitigate harmonic voltage THD to 5% and current THD to 8% maximum levels shall be an integral part of the VFD system. Compliance measurement shall be based on THD added (during VFD full load operation compared to across-the-line operation) at the VFD circuit breaker terminals or actual THD measurement at the VFD circuit breaker terminals during full load VFD operation. Designs which employ shunt tuned filters must be designed to prevent the importation of outside harmonics which could cause system resonance or filter failure. Calculations supporting the design, including a system harmonic flow analysis, must be provided as part of the submittal process for shunt tuned filters. Any filter designs which cause voltage rise at the VFD terminals must include

documentation in compliance with the total system voltage variation of plus or minus 10%. Documentation of Power Quality compliance shall be part of the commissioning required by the VFD supplier. Actual job site measurement testing shall be conducted at full load and documented in the operation and maintenance manuals. Harmonic measuring equipment utilized for certification shall carry a current NiTS calibration certificate. The final test report shall be reviewed, and compliance certification stamped by a licensed professional engineer (PE).

3.3 SUPPORTS AND FOUNDATIONS

- A. Support all items covered by this Specification directly from building structural members independent of any ceilings or any other installed item. Panelboards and switches may be attached to suitably reinforced walls. Ground or slab mounted equipment shall be mounted on a separate four-inch-high concrete slab. Extending 6" beyond equipment footprint on all sides.
- B. Do not attach items of this Specification to HVAC ductwork, ceiling grids and ceiling support members, piping or other equipment unless specifically shown otherwise. Where applicable, all equipment including conduit shall be supported from overhead wall, floor or roof structures using galvanized channel or angle members for a rigid support. Position supports and equipment such that access through lay-in ceilings or panels is not impaired and all Code required clearances are maintained.
- C. Where applicable, under no circumstances is the Contractor to attach to or support from any bar joist bridging. Any supports to the bar joists or any structural systems shall be approved by the Architect. All supplemental angle or channel iron required to support equipment of this Specification shall be furnished by the Electrical Contractor.

3.4 EQUIPMENT LAYOUT

- A. The physical location and arrangements of electrical equipment is shown on the Plans and is to be used by the Contractor as a guideline in construction. It is the responsibility of the Contractor to review the Plans with the proposed equipment and equipment of other contractors that are affected, and to ensure that all Code required clearances, wiring distances and maintenance accesses, including equipment heights, of all items are maintained. Alternate arrangements to accomplish the above due to field conditions or changes in physical size of the equipment proposed for the project are to be submitted to the Architect for review before any work is begun or equipment ordered.
- B. All electrical gear arrangements shall be presented in a 1/4-inch scaled drawing showing all equipment, including those of other contractors. This includes all electrical rooms, mechanical rooms, mechanical yards, electrical yards, service platforms, boiler rooms, etc... Include shop drawing cut sheets and applicable information. Indicate on the drawing by dimension all required Code clearances, wiring distances and maintenance access requirements. Where equipment heights are required to be coordinated with architectural or other items, indicate revised heights. Refer to "MOUNTING HEIGHTS."

3.5 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall include the replacement of lamps. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

- B. If the Contractor's office is in excess of a fifty (50) mile radius of the project, he shall appoint a local qualified contractor to perform any emergency repairs or adjustments required during the guarantee period. The name of the contractor appointed to provide emergency services shall be submitted to the Architect/Engineer for approval.

3.6 CLEANING

- A. Refer to the Specification Section relating to PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.
- B. Clean all light fixtures, and lenses prior to final acceptance and replace inoperable drivers or LED modules.

END OF SECTION 26 00 01

SECTION 26 05 00 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions; as appropriate, apply to the work specified in this section.
- B. Refer to all portions of the Contract Documents as well as the plans and specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

PART 2 - PRODUCTS

2.1 WIRE (600 VOLT AND BELOW)

- A. All conductors used in the work shall be soft drawn annealed copper having a composition of not less than 98% of pure copper. Conductors shall be standard code gauge in size, insulated, and shall have insulation rated for use at 600 volts. The contractor's bid shall reflect the use of all copper conductors unless specifically indicated otherwise. When aluminum conductors are used as part of the V.E. process, their use shall be limited to circuits, feeders and services rated 150 Amperes and larger and shall be of the high alloy, compact stranded type, Southwire SIM pull THHN, SIM pull THWN or equivalent. It shall be the contractor's responsibility for properly upsizing the conductors and associated conduit to achieve the equivalent ampere rating of the circuit/feeder/service as specified for copper conductors. As part of this VE item, Contractor shall provide an updated riser diagram (one-line diagram) indicating proposed conductor changes.
- B. Unless otherwise noted or specified, insulation shall be Type THWN. Wires shall be of the single conductor type and shall be stranded. Wire insulation shall not contain any asbestos materials.
- C. Wire #8 AWG and smaller may be type MC-cable where allowed by applicable codes and ordinances. Where installed in health care facilities, MC Cable shall be hospital grade. Emergency power system wiring installed in health care facilities must be installed in conduit – MC-Cable is not allowed for these circuits.
- D. Throughout the system, conductors shall be identified as to phase and voltage of system by color-coding. Color-coding shall be continuous the full length of wire for all wire sizes. Identification by permanent paint bands or tags at outlets will not be acceptable. Surface printing at regular intervals on all conductors shall indicate manufacturer, size, voltage, and insulation type. White and/or gray colored insulation shall be used for grounded conductors and only for grounded conductors.
- E. The color code assigned to each phase wire shall be consistently followed throughout the project. The following systems of color-coding shall be strictly adhered to:
 - 1. 208/120 Volt, 3-Phase, 4-wire Wye Systems
 - a. Grounding leads = green
 - b. Grounded neutral leads = white
 - c. Ungrounded phase wires = black, red and blue
 - 2. 277/480 Volt, 3-Phase, 4-wire Wye Systems
 - a. Grounding leads = green



- b. Grounded neutral leads = gray
 - c. Ungrounded phase wires = brown, orange, yellow
- F. Where multiple neutral conductors are installed in a common raceway, the neutral conductor for each circuit shall be separately identified in accordance with the National Electric Code (NEC).

2.2 CONDUIT

- A. Unless otherwise specified or shown on the drawings, all conduit shall be rigid galvanized steel (RGS), electrical metallic tubing (EMT), or rigid nonmetallic conduit (PVC) as allowed in the paragraphs below.
- B. RGS may be used for conduit shown run underground (red concrete encasement required), may be used in concrete slabs, and shall be used for conduit run exposed to the weather (locations defined as damp locations and wet locations in Article 100 of the NEC) and shall be run in hazardous areas.
- C. EMT shall be used for conduit not encased in concrete, not exposed to the weather, not run underground, and not run in hazardous areas.
- D. PVC may be used for conduit run in concrete slabs or may be run underground (underground only where permitted by NEC and local ordinances). Concrete encasement will not be required on underground runs unless specifically noted or specified elsewhere. PVC shall not be run exposed nor concealed in walls nor above ceilings nor in hazardous areas. When rigid nonmetallic conduit (PVC) is installed underground, it shall be Schedule 80 at all underground road crossings, at all underground driveway crossings, and when required by the NEC or local ordinance or specified otherwise. PVC Schedule 40 may be used at all other underground locations. The only use of exposed above ground PVC conduit shall be for telephone service entrance use up utility poles (Schedule 80 required), for CATV service entrance use up utility pole (Schedule 80 required) or for power utility service entrance use up utility pole (Schedule 80 required).
- E. Where PVC is utilized for underground installations, RGS 90° elbows and conduit shall be utilized to turn conduit vertical and to rise up to above grade/slab. Red concrete encasement shall be required for all elbows and vertical conduits. Refer to detail on plans.
- F. All conduit shall be new and shall bear the inspection label of the Underwriters Laboratories, Inc. (U.L.).
- G. Where multiple conduits are installed underground in the same trench, carlon snap-n-stac spacers, or approved equivalent, shall be utilized and spaced a maximum of 5'-0" apart. Provide pre-cast, 4" thick, concrete bases at each spacer and where conduits are turned to be installed in a vertical orientation. Provide spacers immediately before and after all elbows and where conduit transitions from underground to above ground.
- H. Fittings for rigid steel conduit and EMT shall be hot-dipped galvanized and shall be of an approved type specially designed and manufactured for their purpose.
- I. All flexible conduit, where installed indoors and outdoors, shall be of the flexible liquid tight metallic type. Flexible weatherproof electrical conduit is prohibited from use on this project.
- J. Metallic conduit shall be metallized, sheradized, or hot-dipped galvanized.

- K. Where conduit is installed exposed in finished spaces and on the exterior of the building (excluding mechanical, equipment and electrical rooms), conduit shall be painted to match adjacent surfaces (color as selected by the Architect/Engineer). All other conduit installations shall be complete with factory applied paint finish as manufactured by Allied Tube and Conduit (True Color EMT) or Wheatland Tube Company (Color Check Conduit). All fittings, couplings, boxes, covers, etc. shall match color of conduit. Color of conduit shall comply with color code noted below.

Power and Lighting - Non-Emergency	Standard Conduit Finish
Fire Alarm	Red
Tele/Data/CATV	Green
Security/CCTV	Purple

2.3 METAL-CLAD CABLE (600 VOLTS AND BELOW)

- A. Where permitted by NEC and local codes and ordinances, metal-clad (MC) cables may be used in lieu of conduit and wiring specified elsewhere herein.
- B. Installation of MC cables shall be in compliance with the National Electric Code (NEC).
- C. Conductors shall be softdrawn annealed copper having a composition of not less than 98% of pure copper.
- D. Conductors shall be solid -type, standard Code gauge in size, insulated, and shall be rated for use at 600 volts or below. Minimum size shall be No. 12.
- E. Conductor insulation shall be of a type listed in the NEC and be rated for 75 deg. C (167 deg. F) as a minimum and shall be of a type approved for use in MC cable.

2.4 EXPANSION FITTINGS

- A. Each conduit that is buried in or rigidly secured to the building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion fitting. Expansion fittings shall be made of hot-dipped galvanized malleable iron and shall have a factory-installed packing, which will prevent the entrance of water, a pressure ring, and a grounding ring.
- B. In addition to the grounding ring, a separate grounding conductor shall be provided. This grounding conductor shall be an external flexible copper ground securely bonded by approved grounding straps on each end of the fitting. Grounding conductor may be omitted when expansion fitting includes an approved integral grounding conductor or device.
- C. Where conduits are buried in concrete, they shall cross the building expansion joints at right angles. Ends of conduit shall be provided with insulated bushings.

2.5 OUTLET BOXES

- A. Outlet boxes in concealed conduit systems shall be flush mounted. Boxes shall be galvanized steel of sufficient size to accommodate devices shown and shall have raised covers. Requirements of the NEC shall be minimum.
- B. Boxes for lighting fixtures shall be four-inch (4") octagon, not less than 1-1/2" deep. Where boxes are installed in concrete, boxes designed for this application shall be used.

- C. Outlet boxes for switches and receptacles in concealed work shall be 4" square, and not less than 1-1/2" deep. Flush mounted outlet boxes shall be installed with plaster rings.
- D. Outlet boxes for switches and receptacles installed in exposed conduit system shall be cast iron or cast aluminum Type FD or approved equivalent.
- E. Where multiple outlet boxes are shown to be installed at the same location, they shall be installed using B-Line Series BB8 mounting bracket or approved equivalent. Where single boxes are shown to be installed, the B-Line Series BB2 mounting bracket or approved equivalent shall be used.
- F. Outlet boxes for adjacent rooms shall not be installed in the same stud space to minimize sound transmission.
- G. Outlet boxes used for lighting toggle switches shall have outlet box stabilizer(s) installed.
- H. Outlet boxes installed in rated walls shall receive appropriately rated putty pads as manufactured by 3M or STI.

2.6 PULL BOXES

- A. Furnish and install pull boxes. Boxes shall be code gauge galvanized steel with screw attached access panels unless noted otherwise in top, side or bottom as required.

2.7 OUTLET COVER PLATES

- A. Unless otherwise noted, all outlets including telephone outlets, television outlets, computer outlets, etc. shall be fitted with cover plates of the type indicated below.
- B. Cover plates shall be uniform in design and finish for switches, receptacles, and other outlets requiring cover plates. Plates shall be one (1) piece of the required number of gangs. Sectional plates shall not be used.
- C. Cover plates shall be smooth nylon with gray, white, black, brown or ivory finish. Color shall be selected by the Architect/Engineer to suit the wall finish.
- D. Cover plates shall be brushed aluminum or stainless steel 302/304.
- E. Provide blank coverplates for all un-used/empty device boxes including, but not limited to tele/data, CATV, access controls, etc....boxes.

2.8 WIRING DEVICES

- A. Wiring devices shall be as listed in the following table, except that color of device shall match color of outlet cover plate. Where cover plates are aluminum or stainless steel, device color shall be as selected by the Architect. The "*" in the model numbers indicate color selection to be made.
 - 1. Leviton / Hubbell (or equivalent by Pass and Seymour)
Single Pole-20A (5621-2* / DS120*)
Rocker or Paddle Switch
 - 2. Three Way-20A (5623-2* / DS320*)
Rocker or Paddle Switch

3. Four Way-20A (5624-2* / DS420*)
Rocker or Paddle Switch
4. 20A 125V 2P 3W Duplex (16342-* / DR20*)
Decora Style
Grounded Receptacle
5. 20A 125V 2P 3W Duplex (G5362-00*/ GFRST20SNAP*)
GFCI Receptacles (Indoor)
6. 20A 125V 2P 3W Duplex (G5362-WT*/ GFTWRST20*)
GFCI Receptacles (Outdoor)
7. 20A 125V 2P 3W Duplex (T5833/USB20AC5*)
Grounded Receptacle with USB-A & USB-C Charging Ports
8. 20A 250V 2P 3W (5461*/ HBL5461*)
Grounded Receptacle
9. 30A 250V 2P 3W (5372 / HBL9630FR)
Grounded Receptacle
10. 50A 250V 2P 3W (5374 / HBL9650FR)
Grounded Receptacle

2.9 WEATHERPROOF RECEPTACLES

- A. Weatherproof receptacles shall be duplex receptacles of the ground fault current interrupting type as specified under WIRING DEVICES, mounted in a cast iron or cast aluminum Type FD (or approved equivalent) conduit fitting with Leviton No. 5997-DGY, (or approved equivalent) clear, extra deep GFCI Style weather resistant cover. Weatherproof receptacles shall be flush mounted in exterior walls whenever possible.

2.10 PHOTOELECTRIC CONTROLS

- A. Unless otherwise noted on the drawings, photoelectric controls shall be electronic-stem/swivel with sensor on side: Intermatic EK4236S or equivalent by Voltage and power requirements of circuits controlled per drawings.

2.11 DIMMER SWITCHES

- A. Dimmer switches shall be Legrand Radiant series, Acuity Brands nLight nPODMA series, Acuity Brands sPODMA series or approved equivalent. Ratings shall be of appropriate wattage for the circuits to be controlled. Provide and install all required 0-10V. control interface units for all LED lighting circuits. Dimmer loading shall not exceed 80% of the dimmer rating. Dimmers shall be UL listed.

2.12 FLOOR OUTLETS/FLOOR BOXES

- A. Floor outlets shall consist of the assembly of wiring devices, floor boxes and fittings. Floor boxes shall be 16 gauge galvanized sheet metal complete with fusion-banded epoxy paint. Boxes shall be fully adjustable before concrete pour.
- B. Contractor shall adjust box such that coverplate is flush against floor surface. When multiple floor outlets are shown directly adjacent to each other, multiple gang type boxes

with separating partitions between each gang shall be utilized. Provide separate conduit for each function.

- C. Floor boxes shall be round with threads for conduits or hubs as required and be of suitable height for concrete slab use. Box shall be capable of accepting duplex receptacles and/or other wiring devices or usage as indicated.
- D. Each floor box shall be Legrand Resource RFBA Series Round Activation floor boxes, (or equivalent) with round covers. Quantity of gangs/size of box shall be individually determined by each location's requirements. Provide equivalent fire-rated poke-thrus as required by floor assemblies.
- E. Where box is to be installed in an existing concrete slab above the ground level, caution must be taken to ensure that the structural integrity of the slab is not impaired by the box installation. Coordinate with the Architect. Use a core drill, poke through device, fire rated to at least the rating of the floor system, as per National Electrical Code (NEC). Depth of unit shall be as required. Hole by the Electrical Contractor. Color by Architect during shop drawing submittal. Color choices shall include satin brass, nickel, grey powder coated, brass, bronze, brushed aluminum, black power-coated, brass-plated, bronze-plated and/or satin nickel-plated.
- F. As a minimum, provide and install two (2) 120V duplex convenience receptacles, four (4) RJ-45 data outlets in each floor box, four (4) USB charging ports and two (2) HDMI ports.

PART 3 - EXECUTION

3.1 MOUNTING HEIGHTS

- A. Unless otherwise noted on the drawings or required by the Architect/Engineer, the mounting heights set forth below shall apply. Dimensions given are from finished floor to the top of the device unless noted otherwise noted.

1.	Toggle Switches	4'-0" to top of device
2.	Receptacles	1'-6" to bottom of receptacle
3.	Panelboards	6'-7" to top of can
4.	Tele/Data Outlets	1'-6" to bottom of outlet
5.	Motor Control Equipment	5'-0"
6.	Fire Alarm Audio/Visual	6" from ceiling on wall and in between 80" and 96"*
7.	Fire Alarm Hand Stations	4'-0" to top of device
8.	Fire Alarm Visual Only	6" from ceiling on wall *
9.	Electric Water Cooler	Concealed behind unit **

* Mounting height shall be 6" from ceiling or maximum 80" above finished floor, whichever is lowest.

** Contractor shall be responsible for coordinating exact location in field with the plumbing contractor.

- B. Where overcurrent or safety switch devices are shown to serve exterior equipment, the Contractor shall review in detail with the Architect/Engineer proposed exterior mounting locations, mounting heights, conduit routing, etc., and receive approval prior to rough-in.
- C. Where overcurrent or safety switch devices are shown to serve condensing units, the top of the overcurrent device shall be 3'- 0" AFG or level with the top of the condensing unit(s) whichever is lower. Refer to detail on plans for additional requirements.

3.2 WIRE (600 VOLT AND BELOW)

- A. Service entrance, feeders, and motor circuit conductors shall be run their entire length without joints or splices. Splices and joints in branch circuit wiring shall be only at outlets or in accessible junction boxes.
- B. Joints and splices in branch circuit wiring shall be made with compression type solderless connectors. Connectors of the nonmetallic screw on type are not acceptable.
- C. Terminations or splices for conductors # 6 AWG and larger shall utilize Burndy Unitap, Polaris Black or equivalent connectors.
- D. Unless otherwise specified, all wiring shall be installed in conduit.
- E. No wire shall be smaller than No. 12 for power or lighting service, fixture whips or for switch legs. Wire for each branch circuit shall be of a single size and type from the branch circuit protective device to the last outlet on the circuit unless noted otherwise.
- F. Not more than three (3) branch circuits shall be installed in a raceway for three-phase electrical systems. For single phase electrical systems, the number of circuits in any one raceway shall be limited to two (2).
- G. Branch circuit home run numbers shown on the drawings shall be used for connection of circuit wiring to similarly numbered protective devices in branch circuit panelboards.
- H. Where the length of a home run, from panel to the first outlet exceeds 75 feet (75') for 120-volt circuits or 175 feet (175') for 277-volt circuits, the conductor size shall be No. 10 AWG or that shown on the drawings, whichever is larger.
- I. For all 3-phase circuits, contractor shall provide and install a full-size neutral conductor and a grounding conductor for a complete 5-wire circuit. If the neutral conductor is not required by the equipment, contractor shall install wire nuts on each end of the neutral conductor for future use.

3.3 CONDUIT

- A. When conduits are shown to be installed in the floor slab, under the floor slab, or underground, whenever possible and approved by the Architect/Engineer, conduits one-inch (1") trade size and smaller shall be installed in the concrete floor slab. Conduits embedded in concrete slabs shall have lateral spacing not less than three diameters except where the slab has been specially designed to accommodate closer spacing.
- B. Conduits larger than one-inch (1") trade size shall not be installed in the floor slab and shall be installed a minimum of twelve inches (12") below the floor slab.
- C. Conduits shown underground but not in or under a floor slab shall be installed not less than twenty-four inches (24") below grade. Conduit locations shall be identified by means of 4" wide; detectable, red warning/ marker tape installed in trench in accordance with NEC requirements.
- D. Prior to backfilling of trenches and /or providing concrete encasement, contractor shall take photographs of conduit installation including spacers/supports and concrete support blocks. In addition, prior to backfilling trenches and after concrete encasement, take additional photographs of installation. Submit photographs to engineer upon request.

- E. Rigid conduit joints shall be made with threaded fittings made up tight with at least five threads fully engaged. Compression type threadless fittings and setscrew type fittings shall not be used for RGS unless specifically approved in writing by the Architect/Engineer.
- F. Couplings and connectors for EMT shall be compression type or cast-iron set screw type.
- G. Where conduits enter boxes or cabinets that do not have threaded hubs the conduit shall be secured in place with galvanized locknuts inside and outside and shall have bushings inside for interior locations. All exterior terminations shall be made with Meyers hubs or approved equivalent. Conduits larger than one inch (1") shall have galvanized insulating bushings.
- H. All conduits shall be installed as indicated or scheduled on the drawings and shall be of sufficient size to accommodate the required number of insulated conductors including equipment-grounding conductor. A grounding conductor shall be pulled in every raceway and properly terminated. The Contractor shall increase the conduit size from that shown on the drawings where necessary to accommodate the equipment-grounding conductor and/or where to comply with the NEC.
- I. Unless otherwise noted, conduit shall be run concealed. Conduit runs from wall mounted receptacles, toggle switches, etc. shall be run concealed in walls whenever possible.
- J. Conduit runs shall be straight; elbows and bends shall be uniform, symmetrical, and free from dents or flattening. All conduit shall be installed with runs parallel or perpendicular to walls, ceilings and structural members.
- K. Conduit shall not be run nearer than three inches (3") to hot water or steam pipes except where crossings are unavoidable. Conduit shall be kept at least one inch (1") from covering of pipe crossed and the conductor size shall be increased one (1) size
- L. Conduit shall be held securely in place by approved hangers and fasteners of appropriate design and dimensions for the particular application. Support shall be such that no strain will be transmitted to the outlet box and/or pull box supports. Conduit shall be secured only to the building structure.
- M. All conduit runs shall be installed in accordance with all applicable sections of the National Electrical Code and local codes or ordinances.
- N. Where empty conduits are shown, a #14 pull wire shall be installed and conduits shall be capped.
- O. Terminations to all mechanical equipment and to all dry-type transformers shall be made using a minimum of 12" to a maximum of 24" liquid-tight flexible metallic conduit.
- P. At each concealed junction box in the power and lighting system, identify the panel and circuit number(s) contained in the junction box by writing in permanent marker on the outside of the junction box cover.
- Q. Where conduits are run from condition spaces to/thru un-conditioned spaces, the ends of the conduits shall be sealed (after conductor installation) to prevent the transmission of air from non-conditioned spaces into the conditioned spaces. Expanding spray foam and EYS seals are approved methods of sealing conduits.
- R. For all surface mounted devices, including fire alarm, intercom and nurse call systems, device boxes shall be Wiremold No. R5752 and R5753 or approved equivalent style boxes

sized such that device does not overhang edge(s) of back box. Color of box shall match device.

3.4 METAL-CLAD CABLE (600 VOLTS AND BELOW)

- A. The metallic sheath shall be galvanized steel or aluminum corrugated sheath type and shall be terminated at outlet boxes, cabinets, etc. with fittings specifically approved for such use, which shall properly ground the metallic sheath.
- B. Each metal-clad cable assembly shall have one (1) green insulated ground conductor sized as required by NEC for the application as a minimum size.
- C. Where run in walls, cable shall be fastened using B-Line Series BX4 or approved equivalent cable fasteners. Cable shall be fastened to wall stud not more than 8" from entry into device box.
- D. MC Cable shall be supported horizontally and vertically every 5' minimum or closer where required by NEC and applicable federal, state and local ordinances.

3.5 WIRING DEVICES

- A. All wiring devices installed shall be identified as to which panel serves it and which overcurrent protection device protects the wiring device. This shall be accomplished via panel name and circuit number being written using a permanent marker on the back side of the coverplate.

3.6 MANUFACTURER'S DIRECTION

- A. Contractor shall be responsible for coordinating all aspects of equipment electrical service installation for all electrical gear, devices, mechanical, plumbing, fire protection, architectural, and owner furnished equipment. Contractor shall obtain and review actual manufacturer's installation instructions and shall install electrical facilities to said equipment in accordance with the instructions, NEC, NFPA and contract documents. Should a discrepancy exist between the manufacturer's installation directions and the contract documents, the engineer shall be notified in writing immediately.

3.7 COORDINATION WITH OTHER TRADES

- A. Prior to purchasing and installing any wire and/or conduit for all circuitry to mechanical equipment, owner furnished equipment, and other equipment requiring electrical power furnished by other trades as part of this project, contractor shall review equipment cut sheets and shall verify exact equipment electrical requirements. Any discrepancies between contract documents and equipment submittals shall be immediately brought to the architect/engineer's attention for clarification.

END OF SECTION 26 05 00



SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) as appropriate, apply to the Work specified in this Section.
- B. Refer to all Electrical portions of the specifications, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

1.2 GENERAL

- A. Contractor shall provide grounding of service equipment, transformers, non-current carrying conductive surfaces of equipment, cable tray, metallic raceways, fencing, metal buildings, structures and other equipment as specified herein and as shown on the drawings.

1.3 SCOPE

- A. The equipment shall be grounded as shown on the plans and as specified herein. All metal structures and equipment, including fences, shall be connected to the systems ground grid. Ground conductors must be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Main grounding conductors shall be bare, soft drawn, stranded, single conductor copper wire, and generally sized as follows:
 - 1. Equipment and structures to grid conductor: #3/0 AWG

2.2 CONNECTORS

- A. All connectors shall be of the exothermically welded type.

2.3 GROUND RODS

- A. Ground electrodes shall be copper-clad steel rods nominal 3/4 inch in diameter and ten feet (10') long.

2.4 EXOTHERMIC WELD PROCESS

- A. All wire-to-wire exothermic welds shall be the parallel type. Wire-to-wire rod connections shall be "T" type. To establish a basis of design for quality and type, the following is a partial list of approved Cadweld type connections. Approved equivalent connectors by other manufacturers may be utilized.

Connections	Cadweld Type
Parallel cable-to-cable	PG

Cable to ground rod	GR, FT, NT or NX
Cable to steel	VN
Cable to lug	LA
Cable to rebar	Consult factory (similar to RR)

PART 3 - EXECUTION

3.1 EXPOSED NON-CURRENT-CARRYING METAL PARTS

- A. Ground connections to equipment or devices shall be made as close to the current-carrying parts as possible; that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scale, rust, grease and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all conduits containing circuits protected by overcurrent devices; then properly terminated.
- B. All raceways, cable racks, cable trays, conduits, armored or shielded cable or cables with ground and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground bus. Conduits shall be connected by the grounding bushings or clamps to ground bus. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections of rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together using grounding bushings.
- C. Any conduits entering low voltage (600 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by hub need not be otherwise bonded. Both ends of ground buses in switchboards, etc., shall be separately connected to the main ground bus to form two (2) separate paths to ground.
- D. All metal buildings shall be grounded by separate grounding conductor and ground rods. Fencing (existing and new) shall be grounded as specified herein and as shown on the drawings. Where exposed to physical damage, the ground wires shall be suitably protected with PVC conduit enclosures. Cables below grade shall be laid with a reasonable amount of slack to reduce the possibility of breakage.

3.2 EXOTHERMIC WELD PROCESS

- A. The grounding grid shall be installed and connected as specified herein and as shown on the drawings using an exothermic weld process (Cadweld or other approved manufacturer). Where bolted connections are required, brass/bronze 2-hole pads exothermically welded to the grounding conductor shall be used.
- B. All exothermic weld grounding connections shall be made using exothermic welded Cadweld (or other approved manufacturer) connections, tools and materials.
- C. Unless noted otherwise, all copper-to-copper or copper-to-steel splices and terminating specified shall be made with exothermic welds.
- D. Steel surfaces shall be ground or filed to remove the galvanizing coating and the surface cleaned and dried thoroughly prior to making the welds. All welds shall be repainted with an approved galvanized paint after the welds are made.

- E. Copper surfaces shall be sanded to remove oxides and the surface cleaned and dried thoroughly prior to making the welds. All welds shall be painted with an approved anti-oxide manufactured by T&B or Burndy (or other approved manufacturer) to prevent corrosion.
- F. Brass/bronze split bolts shall be used to connect the fence grounding conductors where shown on the drawings.
- G. Where bolted connections are specified, brass/bronze 2-hole pads shall be utilized except for equipment manufactured neutral and ground busses. The equipment to be grounded shall be cleaned of all paint, dirt, and rust prior to making the bolted connection. All bolts, nuts, washers, and lock washers shall be stainless steel. All such connections shall be coated with an approved anti-oxide compound. Only one (1) 2-hole pad shall be terminated on one (1) set of bolts, nuts and washers.
- H. Where approved in writing by the Engineer, brass/bronze pipe ground clamps or 2 set screw 2-hole pads may be used for special conditions.
- I. Where grounding conductors or PVC conduits penetrate walls, floors, etc., these openings and conduits shall be sealed with Dow Corning No. 2001 Silicone RTV (or other prior approved manufacturer) after installation is complete.
- J. Provide gradual bends for all grounding grid cables wherever possible. Sharp bends will not be permitted. The minimum bending radius should be 8 inches.
- K. The Contractor shall notify the Architect/Engineer when the buried grounding grid is completed for inspection by the Engineer prior to backfilling. Notification should be no less than 24 hours prior to scheduling the backfill of trenches.
- L. The Contractor shall test the grounding grid resistance and continuity. The testing shall be performed after all underground and above ground connections have been made. Refer to "Acceptance Testing" specification section for additional requirements.

END OF SECTION 26 05 26



SECTION 26 05 71 - ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract apply to the Work specified in this Section.
- B. Refer to all Electrical Sections of the Specifications, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

1.2 SUMMARY

- A. This section outlines the acceptance testing requirements and division of responsibility.

1.3 SCOPE

- A. Contractor shall engage the services of a recognized independent NETA Certified testing firm or professional electrical engineering firm for the purpose of performing inspections and tests as herein specified.
- B. The testing firm shall provide all materials, equipment, labor and technical supervision to perform such test and inspections.
- C. It is the intent of these tests to assure that all electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.
- D. The tests and inspections shall determine suitability for energization.

1.4 REFERENCES

- A. All inspections and tests shall be in accordance with the latest editions following applicable codes and standards except as provided otherwise herein.
 - 1. National Electrical Code – NEC
 - 2. National Electrical Manufacturer's Association - NEMA.
 - 3. American Society for Testing and Materials - ASTM
 - 4. Institute of Electrical and Electronic Engineers – IEEE
 - 5. National Electrical Testing Association – NETA
 - 6. American National Standards Institute – ANSI
 - 7. State Codes and Ordinances
 - 8. Insulation Cable Engineers Association – ICEA
 - 9. National Electrical Safety Code – NESC
- B. All inspections and tests shall utilize the following references:
 - 1. Project Design Specifications
 - 2. Project Design Drawings
 - 3. Manufacturer's Instruction Manuals applicable to each particular apparatus.

1.5 QUALIFICATIONS OF TESTING AGENCY

- A. The testing/engineering firm shall be a corporately independent testing organization that can function as an unbiased testing authority, professionally independent of the

manufacturers, suppliers and installers of equipment or systems evaluated by the testing firm.

- B. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations and systems.
- C. The testing firm shall have been engaged in such practices for a similar size project.
- D. The testing firm shall utilize only full-time technicians who are regularly employed by the firm. Electrically unskilled employees are not permitted to perform testing or assistance of any kind. Electricians and/or linemen may assist but may not perform testing and/or inspection services.
- E. The testing firm shall submit the "on site" foreman's qualifications and experience through the Contractor at the pre-construction conference for review and approval by the Engineer.
- F. Contractor shall submit statement of qualifications of proposed testing firm at the pre-construction conference for approval and acceptance by the Engineer.

1.6 DIVISION OF RESPONSIBILITY

- A. Testing firm shall perform the following tests as outlined in these specifications:
 - 1. Ground Resistance Tests
 - 2. Relay Calibration and Tests
 - 3. Thermographic Survey
- B. Contractor shall perform the following tests as outlined in these specifications:
 - 1. Low Voltage Cable
 - 2. Phasing and Rotation Tests

1.7 TEST REPORT

- A. The test report shall include the following:
 - 1. Summary of project.
 - 2. Description of project.
 - 3. Description of test
 - 4. Test results.
 - 5. Conclusions and recommendations.
 - 6. Appendix, including appropriate test forms.
 - 7. Identification of test equipment used.
 - 8. Signature of responsible test organization authority.
- B. Furnish three printed (3) copies of the complete report to the Engineer prior to requesting substantial completion and no later than thirty (30) days after completion of testing procedures unless directed otherwise. After acceptance of the report, Contractor shall submit an electronic copy of the report in PDF format.
- C. All tests shall be performed with apparatus de-energized except where otherwise specifically required.
- D. The testing firm shall have a designated safety representative on the project to supervise operations with respect to safety.

- E. The testing firm shall have a calibration program that assures that all applicable test instrumentation is maintained within rated accuracy. The accuracy shall be directly traceable to the National Bureau of Standards. Instruments shall be calibrated in accordance with the following frequency schedule:
- F. Field Instruments: Analog - 6 months maximum
 Digital - 12 months maximum
- G. Laboratory Instruments: 12 months
- H. Leased specialty equipment: 12 months
- I. Dated calibration labels shall be visible on all test equipment.
- J. Records must be kept up to date which show date and results of instruments calibrated or tested.
- K. An up-to-date instrument calibration instruction and procedure will be maintained for each test instrument.
- L. Calibrating standard shall be of higher accuracy than that of the instrument tested.

1.8 GENERAL

- A. An outline of tests required is included in this section. Refer to applicable NETA, ANSI, NEMA, IEEE and other test standards for exact procedures, methods and requirements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTS

- A. Upon completion of the work, the entire electrical system shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications.

3.2 GROUND RESISTANCE TESTS

- A. Inspect ground system for compliance with plans and specifications.
- B. Perform 3-point fall-of-potential test per IEEE Standard No. 81, Section 9.04 on the main grounding electrode or system.
- C. Perform the 2-point method test per IEEE No. 81, Section 9.03 to determine the grounding resistance between the main grounding system and all major electrical equipment frames, system neutral and/or derived neutral points.
- D. Alternate Method to Item C Above: Perform ground continuity test between main ground system and equipment frame, system neutral and/or derived neutral point. This test shall be made by passing a minimum of ten (10) amperes dc current between ground reference system and the ground point to be tested. Voltage drop shall be measured and resistance calculated by voltage drop method.
- E. The main ground electrode system resistance to ground shall be no greater than one (1) ohm at the pad mounted transformer at the Service Entrance and at all step-down/step-up transformers.

3.3 LOW VOLTAGE CABLE, 600 V MAXIMUM

- A. Compare cable data with drawings and specifications. Inspect exposed sections of cables for physical damage and correct connection in accordance with one-line diagram.
- B. Verify tightness of accessible bolted connection by calibrated torque wrench in accordance with manufacturer's published data. Perform thermographic survey.
- C. Inspect compression-applied connectors for correct cable match and indentation.
- D. Verify cable color-coding with applicable Engineer's specifications.
- E. For all service entrances, switchboards, MCC and all panelboard feeders, perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for one minute.
- F. Perform continuity test to insure correct cable connection.
- G. Bolt-torque levels shall be in accordance with manufacturer's requirements. Measure and record results.
- H. Minimum insulation-resistance values shall be not less than 50 mega-ohms.
- I. Investigate and report on all deviations between adjacent phases.

3.4 PHASING AND ROTATION:

- A. Perform phasing test on each circuit tie section energized by separate sources.
- B. Perform tests from permanent source.
- C. Damage caused due to omission of this test shall be corrected at Contractor's expense.

3.5 THERMOGRAPHIC SURVEY:

- A. Thermographic survey shall be performed with equipment utilizing long wave technology that provides photo record of deficient areas.
- B. Equipment to be inspected shall include all current-carrying devices installed under this contract, generally, all new high and low voltage cable terminations and splices. Specific equipment to be surveyed includes the following.
 - 1. Panelboards
 - 2. TVSS Units
 - 3. UPS Units (rotary and/or battery based)
 - 4. Safety Switches (fused and non-fused)
- C. Inspect physical, electrical and mechanical condition. Remove all necessary covers prior to thermographic inspection.
- D. Provide report including the following:
 - 1. Discrepancies.
 - 2. Temperature difference between the area of concern and the reference area.
 - 3. Cause of temperature difference.

4. Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.
5. Identify load conditions at time of inspection.
6. Provide photographic thermograms of all equipment (non-deficient and deficient areas). Provide corresponding digital photograph (non-thermal image) of electrical equipment scanned.
7. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 degree C at 30 degrees C.
8. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
9. Thermographic surveys should be performed during periods of maximum possible loading but not less than 40 percent of rated load of the electrical equipment being inspected. Refer to NFPA 70B-1994, Section 18-16 (Infrared Inspection).
10. Temperature differences for 1 degree C to 3 degrees C indicate possible deficiency and warrant investigation.
11. Temperature differences of 4 degrees C to 15 degrees C indicated deficiency; repair as time permits.
12. Temperature differences of 16 degrees C and above indicate major deficiency; repair immediately.

END OF SECTION 26 05 71

SECTION 26 05 72 - OVERCURRENT PROTECTIVE DEVICE
SHORT-CIRCUIT STUDY



PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Short-circuit study input data, including completed computer program input data sheets.
 - 2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
 - a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
 - b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.
- C. At the conclusion of the project, contractor shall have the specified studies updated to reflect "As-Installed" conditions and submit the revised studies as part of the O&M manuals. This includes the electronic software data files, PDF of the study and PDF's of the appropriate labels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Short-Circuit Study Specialist and Field Adjusting Agency.
- B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.
- B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. SKM Systems Analysis, Inc.
 - 2. ETAP
- B. Comply with IEEE 399 and IEEE 551.
- C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

- C. One-line diagram, showing the following:
1. Protective device designations and ampere ratings.
 2. Cable size and lengths.
 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, and panelboard designations.
- D. Comments and recommendations for system improvements, where needed.
- E. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
 3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
 5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.
- G. Short-Circuit Study Output:
1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.
 2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - i. Based on fault-point X/R ratio.
 - ii. Based on calculated symmetrical value multiplied by 1.6.
 - iii. Based on calculated symmetrical value multiplied by 2.7.
 3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Obtain all data necessary for the conduct of the study.
 - 1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Engineer.
 - 2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
 - 3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E
- B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
 - 1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 - 2. Obtain electrical power utility impedance at the service.
 - 3. Power sources and ties.
 - 4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 - 5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 - 6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
 - 7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
 - 8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
 - 9. Motor horsepower and NEMA MG 1 code letter designation.
 - 10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on the device characteristics supplied by device manufacturer.
- D. The extent of the electrical power system to be studied is indicated on Drawings.
- E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.

2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
1. Electric utility's supply termination point.
 2. Incoming switchgear.
 3. Unit substation primary and secondary terminals.
 4. Low-voltage switchgear.
 5. Motor-control centers.
 6. Control panels.
 7. Standby generators and automatic transfer switches.
 8. Branch circuit panelboards.
 9. Disconnect switches.

3.3 ADJUSTING

- A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

- A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION 26 05 72

SECTION 26 05 73 - OVERCURRENT PROTECTIVE DEVICE
COORDINATION STUDY



PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Coordination-study input data, including completed computer program input data sheets.
 - 2. Study and equipment evaluation reports.
 - 3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
 - a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
- C. At the conclusion of the project, contractor shall have the specified studies updated to reflect "As-Installed" conditions and submit the revised studies as part of the O&M manuals. This includes the electronic software data files, PDF of the study and PDFs of the appropriate labels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Coordination Study Specialist and Field Adjusting Agency.
- B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. The following parts from the Protective Device Coordination Study Report:
 - i. One-line diagram.
 - ii. Protective device coordination study.
 - iii. Time-current coordination curves.
 - b. Power system data.

1.7 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.
- B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Software Developers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. SKM Systems Analysis, Inc.
 - b. ETAP

- B. Comply with IEEE 242 and IEEE 399.
- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
 - 1. Optional Features:
 - a. Arcing faults.
 - b. Simultaneous faults.
 - c. Explicit negative sequence.
 - d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

- A. Executive summary.
- B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Cable size and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center, and panelboard designations.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
- F. Protective Device Coordination Study:
 - 1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
 - a. Phase and Ground Relays:
 - i. Device tag.
 - ii. Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
 - iii. Recommendations on improved relaying systems, if applicable.
 - b. Circuit Breakers:
 - i. Adjustable pickups and time delays (long time, short time, ground).
 - ii. Adjustable time-current characteristic.
 - iii. Adjustable instantaneous pickup.
 - iv. Recommendations on improved trip systems, if applicable.
 - c. Fuses: Show current rating, voltage, and class.

- G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
 2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
 3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
 4. Plot the following listed characteristic curves, as applicable:
 - a. Power utility's overcurrent protective device.
 - b. Medium-voltage equipment overcurrent relays.
 - c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
 - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
 - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
 - f. Cables and conductors damage curves.
 - g. Ground-fault protective devices.
 - h. Motor-starting characteristics and motor damage points.
 - i. Generator short-circuit decrement curve and generator damage point.
 - j. The largest feeder circuit breaker in each motor-control center and panelboard.
 5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
 6. Provide adequate time margins between device characteristics such that selective operation is achieved.
 7. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

- A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
- B. Comply with IEEE 399 for general study procedures.

- C. The study shall be based on the device characteristics supplied by device manufacturer.
- D. The extent of the electrical power system to be studied is indicated on Drawings.
- E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
 - 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 - 2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.
- F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- G. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
 - c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
 - 2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
- H. Motor Protection:
 - 1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
 - 2. Select protection for motors served at voltages more than 600 V according to IEEE 620.
- I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.
- K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
 - 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
 - 1. Electric utility's supply termination point.
 - 2. Switchgear.
 - 3. Unit substation primary and secondary terminals.
 - 4. Low-voltage switchgear.

5. Motor-control centers.
6. Standby generators and automatic transfer switches.
7. Branch circuit panelboards.

M. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3.3 LOAD-FLOW AND VOLTAGE-DROP STUDY

- A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
 2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
 3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.4 MOTOR-STARTING STUDY

- A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of the motor starting on the power system stability.
- B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.5 POWER SYSTEM DATA

- A. Obtain all data necessary for the conduct of the overcurrent protective device study.
1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
 2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
 3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.
- B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams,

- overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical power utility impedance at the service.
 3. Power sources and ties.
 4. Short-circuit current at each system bus, three phase and line-to-ground.
 5. Full-load current of all loads.
 6. Voltage level at each bus.
 7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
 10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
 11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
 12. Maximum demands from service meters.
 13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
 14. Motor horsepower and NEMA MG 1 code letter designation.
 15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
 16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
 17. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
 - d. Generator thermal-damage curve.
 - e. Ratings, types, and settings of utility company's overcurrent protective devices.
 - f. Special overcurrent protective device settings or types stipulated by utility company.
 - g. Time-current-characteristic curves of devices indicated to be coordinated.
 - h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
 - i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
 - j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
 - k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.6 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

- A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:
 - 1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
 - 2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
 - 3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION 26 05 73

SECTION 26 05 74 - OVERCURRENT PROTECTIVE DEVICE
ARC-FLASH STUDY



PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

- A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
- C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.
- D. SCCR: Short-circuit current rating.
- E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Arc-flash study input data, including completed computer program input data sheets.
 - 2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
 - a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
- C. At the conclusion of the project, contractor shall have the specified studies updated to reflect "As-Installed" conditions and submit the revised studies as part of the O&M manuals. This includes the electronic software data files, PDF of the study and PDFs of the appropriate labels.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Arc-Flash Study Specialist and Field Adjusting Agency.
- B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.
- B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.
- B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Software Developers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. SKM Systems Analysis, Inc.
 - b. ETAP
- B. Comply with IEEE 1584 and NFPA 70E.

- C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

- A. Executive summary.
- B. Study descriptions, purpose, basis and scope.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Cable size and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.
 - 4. Motor and generator designations and kVA ratings.
 - 5. Switchgear, switchboard, motor-control center and panelboard designations.
- D. Study Input Data: As described in "Power System Data" Article.
- E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."
- F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."
- G. Arc-Flash Study Output:
 - 1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. No AC Decrement (NACD) ratio.
 - e. Equivalent impedance.
 - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
 - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis
- H. Incident Energy and Flash Protection Boundary Calculations:
 - 1. Arcing fault magnitude with and without required Arc Energy Reduction methods.
 - 2. Protective device clearing time.
 - 3. Duration of arc.
 - 4. Arc-flash boundary.
 - 5. Working distance.
 - 6. Incident energy.
 - 7. Hazard risk category.
 - 8. Recommendations for arc-flash energy reduction.
- I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.
- B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
 - 1. Location designation.
 - 2. Nominal voltage.
 - 3. Flash protection boundary.
 - 4. Hazard risk category.
 - 5. Incident energy.
 - 6. Working distance.
 - 7. Engineering report number, revision number, and issue date.
- C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

- A. Comply with NFPA 70E and its Annex D for hazard analysis study.
- B. Preparatory Studies:
 - 1. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."
- C. Calculate maximum and minimum contributions of fault-current size.
 - 1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
 - 2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
- D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.
- E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.
- F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

- G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
1. Fault contribution from induction motors should not be considered beyond three to five cycles.
 2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).
- H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
1. When the circuit breaker is in a separate enclosure.
 2. When the line terminals of the circuit breaker are separate from the work location.
- I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

- A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Engineer.
 2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
 3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.
- B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Obtain electrical power utility impedance at the service.
 3. Power sources and ties.
 4. Short-circuit current at each system bus, three phase and line-to-ground.
 5. Full-load current of all loads.
 6. Voltage level at each bus.
 7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
 8. For reactors, provide manufacturer and model designation, voltage rating and impedance.

9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

- A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:
 1. Motor-control center.
 2. Low-voltage switchboard.
 3. Switchgear.
 4. Medium-voltage switch.
 5. Control panel.

3.5 APPLICATION OF WARNING LABELS

- A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

- A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 26 05 74



SECTION 26 09 23 - OCCUPANCY SENSORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) as appropriate, apply to the Work specified in this Section.
- B. Refer to all other Electrical specification sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

1.2 GENERAL

- A. Contractor shall provide and install motion sensors in accordance with the plans and specifications herein. System shall be installed to provide detection system coverage of the entire space the sensors are located in. It is understood that due to some manufacturer's devices providing different coverage patterns, the plans represent a generic system. Contractors shall evaluate each space individually and shall at no additional costs to the owner, provide additional detection sensors where required to provide a complete coverage pattern and shall also adjust installation locations to retain the coverage while reducing false triggers of the sensors.

PART 2 - PRODUCTS

2.1 WALL MOUNTED SENSORS

- A. For single-pole/single switch applications wall mounted motion sensors shall be IR-TecLDS700S, Watt Stopper No.: DSW-100, Lutron MS-A102, Greengate ONW-D-1001-MV, Leviton ODS10, Acuity Controls (Sensor Switch) WSX-PDT.
- B. For two-pole/dual switch applications, wall mounted motion sensors shall be IR-TecLDT700S or Watt Stopper No.: DSW-200, Greengate ONW-D-1001-DMV, Leviton ODSOD, Acuity Controls (Sensor Switch) WSX-PDT-2P.
- C. Color of sensor shall be selected by Architect/Engineer during shop drawing submittal.

2.2 CEILING MOUNTED SENSORS

- A. Ceiling mounted motion sensors shall be IR-Tec-BDS-600S, Watt Stopper No. DT-305, Lutron LOS-CDT-2000-WH, Greengate OAC-DT-2000, Sensor Switch CM-PDT-9 (or 10 depending upon coverage required for space) or approved equivalent.
- B. All relays, contactors, and power packs required to provide a fully operational system shall be provided and installed at no additional cost to the owner.
- C. Install device using properly sized device box recessed in ceiling. Utilize MC-cable to run all conductors. Install power pack in properly rated junction box.
- D. Color of sensor shall be selected by Architect/Engineer during shop drawing submittal.

2.3 POWER/SWITCH PACKS

- A. Power packs shall employ zero crossing circuit to limit inrush current. Contacts shall be dry-type (Isolated) twenty-ampere (20A). Leads shall be Class 2 Teflon insulated for use in plenums. Power pack shall be rated for both 120 volt and 277-volt operation.
- B. Install device using properly sized device box recessed in ceiling. Utilize flexible conduit to run all control voltage conductors. Install power pack in properly rated junction box.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Should a particular manufacturer's product require that additional sensors and associated wiring and accessories be provided to allow full and complete coverage of the space, the additional sensors and associated wiring and accessories shall be provided at no additional cost to the owner.
- B. Installation of motion sensor shall be such that motion is detected as soon as a person enters the particular room and with the sensor being a minimum of four feet (4') from any HVAC diffuser/register.
- C. All sensors shall be installed on the line side of all toggle switches so that power is maintained to the sensor at all times.
- D. Prior to requesting substantial completion, contractor shall coordinate with the owner to determine the length of time the sensors shall keep the lighting illuminated after the room is vacated and shall program sensors accordingly. Time shall be adjustable from a minimum of 5 minutes to a maximum of 30 minutes. Contractor shall provide a minimum of one additional setting adjustment per sensor installed for the duration of the one-year warranty period.

3.2 SUBMITTALS

- A. Prior to installation, contractor shall submit a proposed layout in shop drawings indicating all sensor and power pack locations. The sensor Contractor shall be responsible for such layout.
- B. At time of substantial completion, contractor shall submit how each and every sensor is programmed including but not limited to trigger on technology, maintain on technology, time delay to off.

3.3 MISCELLANEOUS ITEMS

- A. Contractor shall be responsible for providing all relays, contactors, power packs, etc. to provide a complete motion detecting lighting switching circuit.

END OF SECTION 26 09 23

SECTION 26 27 13 - ELECTRICAL DISTRIBUTION SYSTEM

PART 1 - GENERAL



1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions); as appropriate, apply to the work specified in this section.
- B. Refer to all Electrical specification sections, as well as the plans and specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

1.2 ELECTRIC SERVICE

- A. Contractor shall modify existing normal (and emergency) 480 volt 3 phase 4 wire electrical system(s) at the facility as specified herein and noted on the drawings. This Contractor shall be responsible for the coordination of all electrical work with the local utility company, Cleco. Contractor shall be responsible for determining the proper breakers and connectors to tie into the existing electrical systems. Short circuit current interrupting rating of new breakers shall match rating of existing breakers. Contractor shall be responsible for examining the panelboards to be tied into, building structure, and site, and shall include in his bid all materials and time (regular pay and overtime pay) to install the new feeders avoiding conflicts with existing equipment to remain.

1.3 GENERAL

- A. All electrical gear furnished as part of this project, panelboards, switchboards, motor control centers, dry-type transformers, safety switches, etc. shall be of the same manufacturer unless specified otherwise. Electrical equipment manufactured by a subsidiary or parent company of manufacturer that is prior approved is not itself prior approved unless its own manufacturer's name specifically is listed as being prior approved.

1.4 COORDINATION AND FAULT CURRENT STUDIES

- A. As part of the electrical gear shop drawings, the contractor shall perform and submit complete coordination and fault current studies, including phase-to-phase and ground faults for coordinating all elements of the distribution system. These three studies shall be performed and furnished by the successful electrical gear manufacturer. Contractor shall refer to these specification sections for specific study requirements: These studies shall be submitted simultaneously with the gear submittal, or the gear submittal will be returned un-reviewed.
 - 1. Overcurrent Protective Device Short-Circuit Study (Cannot be VE'd from project)
 - 2. Overcurrent Protective Device Coordination Study
 - 3. Overcurrent Protective Device Arc-Flash Study(Cannot be VE'd from project)
- B. Provide all arc-flash safety and short circuit current stickers on all panels, switchboards, safety switches, motor control center, etc. as required/specified. Refer to details for additional requirements. Proposed stickers for each individual piece of gear shall be submitted for review as part of shop drawings.
- C. Provide and install a fully coordinated electrical distribution system as directed by the Overcurrent Protective Device Coordination Study at no additional costs to the Owner.

- D. In addition, this study shall indicate all required settings for adjustable circuit breakers and motor circuit protectors. These settings include instantaneous, short time, long time, ground fault trip characteristics and all-time based pick-up, drop-out and re-close parameters.
- E. The contractor shall provide all breakers, trip plugs, solid state breakers, etc. to provide a fully coordinated electrical system as identified in the coordination study. This shall be accomplished as part of the Base Bid and all alternates at no additional costs to the owner and/or design team.
- F. Refer to individual specification sections of each specified study for additional requirements.
- G. Electrical gear submittals will not be reviewed until all device studies specified are performed, submitted and approved.
- H. At the conclusion of the project, contractor shall have the specified studies updated to reflect "As-Installed" conditions and submit the revised studies as part of the O&M manuals. This includes the electronic software data files, PDF of the study and PDFs of the appropriate labels.

1.5 SERIES RATING OF EQUIPMENT

- A. The electrical gear provided and installed as part of this project shall not be series rated.

PART 2 - PRODUCTS

2.1 PANELBOARDS

- A. Panelboards shall be circuit breaker type using quick-make, quick-break, trip free, thermal magnetic trip indicating, bolt-on circuit breakers. Two and three pole branches and mains shall be common trip. Panelboards shall be dead front safety type with main breaker or main lugs, and number and size of branches as shown on the drawings. Panelboards shall have single, feed through, or double lugs, to accommodate feeder conductors as shown on the drawings, and shall have neutral and ground bus for termination of conductors. Bussing shall be copper.
- B. Doors shall be fitted with flush cylinder locks, keys to which shall all on project be alike. Two (2) keys shall be furnished for each lock. Cabinet fronts shall be finished as directed by the Architect/Engineer. Cabinet fronts shall not be removable with door in the locked position. Provide for each panel a directory frame with waterproof transparent plastic window on inside of door and place therein a typewritten identification of all circuits.
- C. Directories shall be made only after permanent room numbers have been assigned. Room numbers shown on the construction drawings shall not be used for making directories. Each circuit shall be clearly identified as to use and location (ex: Receptacles Rooms 201, 202 or Lighting Rooms 207, 209, 211, and 213).
- D. Cabinets shall be galvanized steel not less than twenty inches (20") in width. Gutters shall not be smaller than minimum dimensions required by the National Electrical Code.
- E. Double section panelboards shall be comprised of cabinets of equal dimensions.
- F. All panels rated NEMA 1, shall be of the door-in-door type construction providing tool-less access to interior of the panelboard(s).

- G. Panelboards shall be as shown in the schedules and shall be completely factory assembled. Do not purchase panelboards or cabinets until shop drawings have been approved. Approved manufacturers include:
1. General Electric
 2. Square D
 3. Eaton-Cutler Hammer
 4. Siemens
 5. Approved Equivalent
- H. Minimum short circuit current interrupting ratings for circuit breakers shall be 10,000 amps. Where a specific interrupting rating is shown on the drawings, in the panel schedules, or as required by the coordination and fault current study, panelboards and associated circuit breakers shall be rated for that value as a minimum at no additional cost to the owner.
- I. In branch circuit panelboards having two (2) vertical columns of devices, circuit numbers shall be such that, starting at the top, odd numbers shall be used in sequence down the left-hand side. See Schedule of Panelboards on drawings for circuit device sizes and number of poles.
- J. Construction of panelboards shall be such that, where applicable, any three (3) adjacent single-pole devices are individually connected to each of the three different phases in such a manner that 2 or 3 pole devices, when available, can be installed at any location.
- K. UL Listing: Panelboards shall be listed by UL and bear the UL label.
- L. Interior panelboards shall be NEMA 1 unless noted otherwise. All exterior panelboards shall be rated NEMA 3R.

2.2 LABELS

- A. All switchboards, panelboards, starters, VFD's, contactors, transformers, safety switches and fused safety switches installed by this contractor shall have laminated phenolic tags with 1/4" characters embossed thereon identifying the equipment by name, voltage, ampacity, phase and number of current carrying conductors such as:

Panel Name
120/208 V - 400A
3 Phase - 4 Wire
Fed From Panel: _____, Circuit _____
Fused @ _____**

The tags shall be fixed to the center of the equipment cover/door with a suitable heavy duty industrial grade adhesive.

**Note – For fused safety switches, label shall include fuse sizes contained therein.

- B. Color Coding of labels shall be as follows:

Normal Power

White Background with Black Letters

2.3 DRY-TYPE TRANSFORMERS

- A. Dry-type transformers shall be three phase, 60 cycle with 480-volt delta primary windings and 120/208 volt, 4-wire wye secondary windings with capacities and mounting arrangements as indicated on the drawings. Each transformer shall have four (4) 2-1/2%

FCBN taps, except that two (2) full current taps above normal and two (2) below normal will be acceptable where this is manufacturer's standard for the particular size.

- B. Transformers shall have internally isolated core and coil and shall be built with 220 Class insulation and shall have a temperature rise not to exceed 115° C where installed indoors or not to exceed 150° C where installed outdoors. Where shown on plans where transformers are stacked, both transformers shall have a temperature rise not to exceed 80° C, under full load in an ambient temperature of 40° C. Windings shall be copper.
- C. Units shall be designed for quiet operation with core and coil completely isolated from the enclosure by vibration absorbing mounts. Sound levels shall not exceed 45 db for 75 KVA or below, or 50 db for units above 75 KVA in an ambient of 24 db.
- D. Enclosures shall be NEMA 1 for secured interior locations, NEMA 3R for secured exterior locations, and totally enclosed for all unsecured locations.
- E. Enclosures shall be constructed of heavy code gauge steel with terminal compartments located at the bottom of each unit. Circuit connections shall be made through flexible metallic conduit.
- F. Transformers shall be as manufactured by Square D, General Electric, Eaton Electrical, Siemens, or approved equivalent.

2.4 MAGNETIC CONTACTORS

- A. The Contractor shall furnish and install contactors where shown on the drawings except that contactors shown mounted in branch circuit panelboards shall be factory mounted by panelboard manufacturer.
- B. Contactors shall be of the same manufacturer as the panelboards, disconnect switches, etc.
- C. Contactors shall be suitable for use at the voltage rating of the circuits controlled and shall have the number of poles and ampere rating shown on the drawings as a minimum. Where ampere ratings are not shown, ratings shall be 20 amperes minimum, or as required to match the supply feeder protective device.
- D. Main contacts shall be double break silver alloy to silver alloy type protected by arching contacts. Contacts shall be self-aligning and renewable from the front of the panel.
- E. Contactors shall be Underwriters' Laboratories, Inc. listed under UL 508, 11th Edition. Contactors shall be fully rated and marked for use with motor loads, tungsten lamp loads, and ballast lamp loads.
- F. Remote control stations shall be three-wire momentary contact type with indicator light. Stations shall be arranged as indicated on the drawings and shall be furnished by the contactor manufacturer.
- G. Contactors shall be mounted in suitable enclosures for locations shown with hinged cover and latch.

2.5 LIGHTING CONTACTORS

- A. The Contractor shall furnish and install lighting contactors where shown on the drawings except those contactors shown mounted in branch circuit panelboards shall be factory mounted by panelboard manufacturer. Contactors shall be suitable for use at voltage

rating of circuits controlled and shall have the number of poles and ampere rating shown on the drawings as a minimum.

- B. The contactor amp rating shall be continuous per pole for all types of ballast and tungsten lighting, resistance and motor loads. The contactor shall have totally enclosed, double-break silver-cadmium-oxide power contacts. Auxiliary arcing contacts are not acceptable. Contact inspection and replacement shall be possible without disturbing line or load wiring. The contactor shall have straight-through wiring with all terminals clearly marked. The contactor shall be approved per UL508 and/or CSA and be designed in accordance with NEMA ICS2-211B. They shall be industrial-duty rated for applications to 600 volts maximum. The contactor shall have the following:
 - 1. Control-circuit fuse holder, with one (1) fuse.
 - 2. 0.2-60 second TDE (Time Delay Energize) and TDD (Time Delay De-energize) timer attachments.
- C. The contactor shall have a NEMA Type 1 enclosure and shall be the mechanically held type.
- D. Coil-clearing contacts shall be supplied so that the contactor coils shall be energized only during the instance of operation. Both latch and unlatch coils shall be encapsulated.

2.6 SAFETY SWITCHES

- A. Furnish and install safety switches at locations and in capacities shown on the drawings, as hereinafter specified and/or as required by the latest edition of the National Electrical Code.
- B. Safety switches shall be rated heavy duty and fusible.
- C. Safety switches exposed to the weather shall be rated NEMA 3R.
- D. Safety switches shall be of the solid neutral type where required by circuit or feeder specified.
- E. Safety switch covers shall be internally mechanically held closed when in the ON position and shall be allowed to open in the OFF position. The switch shall come equipped with provisions to allow the switch to be padlocked in the off position.
- F. Galvanized angle or other suitable supports shall be provided for switches that cannot be mounted on walls or other rigid surfaces. Switches shall not be supported by conduit alone and shall not be mounted on HVAC or other equipment unless specifically approved by the Architect/Engineer. Verify mounting heights for all exterior locations with Architect/Engineer prior to rough-in.
- G. Fuses shall be installed so that fuse rating and type are clearly and easily readable from the front of the disconnect.
- H. Safety switches shall be General Electric, Square "D", Eaton Electrical, Siemens or approved equivalent.

2.7 FUSES

- A. Unless otherwise noted or specified, all fuse holders shall be equipped with dual-element, time-lag, and current limiting fuses. Provide one (1) spare set of fuses for each size initially installed, with a minimum of three (3) fuses of each size. Spare fuses shall be turned over

to the Owner's maintenance supervisor prior to requesting substantial completion inspection.

- B. Fuses shall be Gould, Bussman, or approved equivalent.

PART 3 - EXECUTION

3.1 MANUFACTURER'S DIRECTION

- A. All electrical gear shall be installed in accordance with the manufacturer's directions. Contractor shall review these directions prior to rough-in. Should any discrepancies exist between the contract documents and the manufacturer's direction, contractor shall advise the engineer in writing.
- B. All electrical terminations shall be properly tightened to manufacturer's specifications. Where manufacturer's specifications are not available, contractor shall refer to the NEC and adjust tightness values (torque) to the NEC published values.
- C. Install all safety switches, breakers, disconnects, etc., in accordance with manufacturer's directions and maintain all required NEC clearances. Coordinate exact locations in field with applicable contractors.

END OF SECTION 26 27 13



SECTION 26 41 13 - LIGHTNING PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes lightning protection for buildings and associated structures and requirements for lightning protection system components.
- B. The work covered by this section of the specifications consists of furnishing all labor, materials and items of service required for the design and installation and full UL certification of the complete and entire lightning protection system.

1.3 SYSTEM DESCRIPTION

- A. Protect entire building including all roof mounted equipment.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each component specified.
 - 1. Roof adhesive data.
 - 2. Decorative air terminal illustrations.
- C. Shop Drawings detailing lightning protection system design shall include air terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway and data on how concealment requirements will be met.
- D. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by nationally recognized testing laboratory (NRTL) or trade association. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Certification, signed by Contractor, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.
- F. Field inspection reports indicating compliance with specified requirements.
- G. The complete design drawing(s) must be signed and approved by the installing contractor, who is Lightning Protection Institute Certified Master Designer. This signature will assure the proper lightning protection design and installation.

1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Provide UL Master Label for the entire Lightning Protection System.
- C. System shall be compliant with Lightning Protection Institute Standard LPI 175 and upon completion of project Contractor shall provide LPI certification of system.
- D. Provide NFPA 780 compliant system.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by of one of the following:
1. Advanced Lightning Technology
 2. East Coast Lightning Equipment
 3. Preferred Lightning Protection, LLC
 4. Prior approved equivalent manufacturer

2.2 LIGHTNING PROTECTION SYSTEM COMPONENTS

- A. Comply with UL 96A, LPI 175 and NFPA 780.
- B. System Materials: Copper, with solid blunt-tip air terminals, except as otherwise indicated.
- C. Air Terminals for Single-Ply Membrane Roof Mounting: Units with bases especially designed for single-ply membrane roof materials.
- D. Ground Rods: Copper-clad steel with a minimum of 27 percent of rod weight in copper cladding.
1. Diameter: 3/4 inch (nominal)
 2. Length: 10 feet (nominal)

2.3 LIGHTNING PROTECTION EQUIPMENT

- A. All materials shall be copper and bronze and of the size, weight and construction to suit the application and used in accordance with LPI, UL and NFPA code requirements. Class I sized components may be utilized on roof levels 75 feet and below in height. Class II sized components are required for roof levels over 75 feet in height. Bolt type connectors and splicers shall be utilized on Class I and Class II structures. Pressure squeeze clamps are not acceptable. All mounting hardware shall be stainless steel to prevent corrosion.

2.4 ALUMINUM COMPONENTS

- A. Aluminum materials may not be used except on roofs that utilize aluminum, galvalume or galvanized metal roofing components. On aluminum, galvalume or galvanized metal roofs or where aluminum, galvalume or galvanized metal parapet caps exist, the entire roof lightning protection equipment shall utilize aluminum components to insure compatibility. However, the down leads and grounding are to utilize copper with the bimetal transition occurring at the through roof assembly with an approved bimetal through roof assembly.

2.5 SURGE PROTECTION DATA

- A. A surge protection device at the main electrical service entrance is required by lightning protection standards. The surge protection device must comply with UL Standard 1449 as a Type 1 lightning rated unit. Unit shall be a Current Technology SL3 series, or approved equivalent with main breaker. It shall be the responsibility of the Electrical Contractor to provide and install a surge protection device on the main electrical service. Refer to Electrical Specifications for additional requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces, areas, and conditions, with Installer present, for compliance with installation tolerances and other conditions affecting performance of lightning protection. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lightning protection as indicated, according to manufacturer's written instructions.
- B. Comply with UL 96A, LPI-175, and NFPA 780.
- C. Conform to the most stringent requirements when more than one standard is specified.
- D. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops. Where indicated, run conductors in nonmetallic raceway, Schedule 40, minimum.
- E. Conceal system conductors.
- F. Conceal down conductors.
- G. Conceal interior conductors.
- H. Conceal conductors from normal view from exterior locations at grade within 200 feet of building.
- I. Provide notification at least 48 hours before concealing lightning protection components.
- J. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components, except those above single-ply membrane roofing.
- K. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's installation instructions.

- L. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.
- M. Bond ground terminals to counterpoise conductor.
- N. All terminations to ground rods and to counter poise conductor shall be accessible through the use of hand-hole (inspection wells) with bolt-down removable covers. Refer to details for additional requirements.
- O. Bond grounded metal bodies on building within 12 feet of ground to counterpoise conductor.
- P. Bond grounded metal bodies on building within 12 feet of roof to counterpoise conductor.
- Q. Bond grounded metal bodies on building within 12 feet of roof to interconnecting loop at eave level or above.
- R. Bond lightning protection components to grounded metal bodies on building at every 60 feet with intermediate-level interconnection loop conductors.
- S. The installation shall be accomplished by an experienced installation company that is a member of the Lightning Protection Institute (LPI) and an employer of LPI Certified Master Installers of lightning protection systems and UL Listed. For example: Bonded Lightning Protection Systems, Ltd. - 1-800-950-7933 with locations in Dallas, Fort Worth, Houston, Austin, San Antonio, Oklahoma, Louisiana, Alabama. A Certified Journeyman or Master Installer shall supervise the work. All equipment shall be installed in a neat, workmanlike manner. The system shall consist of a complete conductor network at the roof and include air terminals, connectors, splicers, bonds, copper down leads, and proper ground terminals. Copper down lead conductors shall be utilized even when the aluminum is required on the roof. Down lead conductors shall be installed in conduit and shall not be brought directly through the roof. Through roof assemblies with solid brass or stainless-steel rods shall be utilized for this purpose. Structural steel may be utilized in the installation as outlined by LPI, UL and NFPA standards.
- T. The lightning protection installer will work with other trades to insure a correct, neat and unobtrusive installation. The roofing contractor will be responsible for sealing and flashing all lightning protection roof penetrations as per the roof manufacturer's recommendations. However, the lightning protection contractor will be required to coordinate locations of through roofs and submit details of through roof penetrations as required. The lightning protection contractor shall use a compatible adhesive to adhere lightning protection components to the roof when required. The lightning protection contractor shall furnish and install the adhesive and obtain an approval of the compatible adhesive from the roof manufacturer/contractor prior to the installation. Should the roofing contractor/manufacturer require any special walk pads, membrane patches, pavers, etc. under the components of the lightning protection system, it shall be the responsibility of the roofing contractor to furnish and install such items. The lightning protection installer shall be responsible for marking the roof with all conductor and/or pad locations. It shall be the responsibility of the lightning protection installer to assure a sound bond to the main water service and to assure interconnection with other ground systems.
- U. Upon completion of the installation, the lightning protection installer shall conform to the requirements standards for lightning protection systems of the LPI, UL and NFPA. Upon completion the following certifications shall be delivered to the owner; a certification letter and warranty by the installation company, i.e.: Bonded Lightning Protection Systems, Ltd. and an LPI Master Certification, LPI Re-conditioned Certification or LPI Limited Scope

Report from Lightning Protection Institute - Inspection Program (LPI-IP) depending on the lightning protection scope of work.

- V. The lightning protection contractor shall use a compatible adhesive to adhere lightning protection components to the roof when required. The lightning protection contractor shall furnish and install the adhesive and obtain an approval of the compatible adhesive from the roof manufacturer/contractor prior to the installation. Should the roofing contractor/manufacturer require any special walk pads, membrane patches, pavers, etc. under the components of the lightning protection system, it shall be the responsibility of the roofing contractor to furnish and install such items. The lightning protection installer shall be responsible for marking the roof with all conductor and/or pad locations.

3.3 CORROSION PROTECTION

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

- A. Periodic Inspections: Provide the services of a qualified inspector to perform periodic inspections during construction and at its completion, according to LPI-177.
- B. UL Inspection: Apply for inspection by UL as required for UL master labeling of system. Provide a UL certificate for complete system.
- C. ETL Inspection: Provide the services of ETL to inspect completed system for conformance with specified requirements.

END OF SECTION 26 41 13

SECTION 26 43 13 - SURGE PROTECTION FOR LOW-VOLTAGE
ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL



1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.3 DEFINITIONS

- A. I-nominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, I nominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
 - 3. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor can survive published surge current rating on a per mode basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable. In house testing will not be accepted.
 - 4. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage. MCOV shall be a tested value per section 37.7.3 of UL 1449 4th Edition.

2.2 PANEL SUPPRESSORS (Type B and C)

- A. Basis of Design: Subject to compliance with requirements. Provide comparable product by the following:
 - 1. Current Technology "TG3". Equivalent by Square D SurgeLogic "EM Series"
- B. SPDs: Listed as Type 1 SPD per UL1449 4th Edition
 - 1. Include LED indicator lights for power and protection status.
 - 2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
 - 3. Include Form-C contacts rated at 2 to 5 A and 24- V ac to 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
- C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per mode shall not be less than 150 kA (Type B), 300kA per Phase and 50 kA (Type C) 100kA per Phase. The peak surge current rating shall NOT be the arithmetic sum of the ratings of the individual MOVs in a given mode. SPD manufacturer shall provide independent 3rd party testing validating unit is capable of surviving a single surge at the specified rating.

- D. Comply with UL 1283 with a maximum attenuation of 34dB based on 50ohm insertion loss test per MIL-STD-220B
- E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277V or 208Y/120V, three-phase, four-wire circuits shall not exceed the following:
 - 1. Line to Neutral: [1200 V for 480Y/277 V] [700 V for 208Y/120 V].
 - 2. Line to Ground: [1200 V for 480Y/277 V] [700 V for 208Y/120 V].
 - 3. Neutral to Ground: [1000 V for 480Y/277 V] [700 V for 208Y/120 V].
 - 4. Line to Line: [2000 V for 480Y/277 V] [1200 V for 208Y/120 V]
- F. SCCR: Equal or exceed 200 kA.
- G. Inominal Rating: 20 kA

2.3 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 1.
- B. Outdoor Enclosures: NEMA 250, Type 3R.

2.4 CONDUCTORS AND CABLES

- A. Power Wiring: SPD shall be equipped with mechanical lugs that can accept up to #2 AWG wire. Where conductors between SPD and switchgear exceed 10' in total length, they shall be "High Performance Interconnect" (HPI) cables with Ultra Low impedance characteristics at 10kHz and above.
- B. Class 2 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. If installed lead length exceeds 10', SPD manufacturer shall provide a low impedance cable that improves the installed performance.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Contractor shall perform the following tests and inspections with the assistance of a factory-authorized service representative.
1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 2. Inspect anchorage, alignment, grounding, and clearances.
 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.3 SYSTEM TESTING

- A. Upon completion of installation, provide the start-up and testing services of a factory-authorized and factory-trained local service representative. The tests shall include:
1. Off-line Testing: Impulse injection to verify the system tolerances as well as verification of proper facility neutral-to-ground bond. Compare field test results to factory benchmark test parameters supplied with each individual unit.
 2. On-line Testing: Verify that suppression and filtering paths are operating with 100% protection as well as verification of proper facility neutral-to-ground bond by measuring neutral-to-ground current and voltage and by visual inspection.
 3. Voltage measurements from Line-to-Ground (L-G), Line-to-Neutral (L-N), Line-to-Line (L-L), and Neutral-to-Ground (N-G), taken at the time of the testing procedure.

3.4 DOCUMENTATION AND REPORTING

- A. Record results of field testing and compare to factory benchmark test parameters supplied with each individual surge protective device. Indicate that the integrity of neutral-to-ground bonds were verified through testing and visual inspection, and that grounding bonds were observed to be in place.
- B. Submit to the Owner's representative and to the Architect/Engineer copies of the startup test results and the factory benchmark testing results for confirmation of proper suppression filter system function, as required by this section. Provide the number of copies as required by Division One and the Electrical General Provisions section; and three copies where not otherwise specified.

END OF SECTION 26 43 13

SECTION 26 51 00 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) as appropriate, apply to the Work specified in this Section.
- B. Refer to other Electrical specifications, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding electrical work.

1.2 GENERAL

- A. The Contractor shall furnish and install lighting fixtures and accessories as shown on the drawings and/or described herein.
- B. Unless otherwise specified, lighting fixtures shall be permanently installed and connected to the wiring system.
- C. The Contractor shall support each new fixture independently, from the building structure. Ceiling framing members shall not be used to support fixtures except in specific areas where ceiling supports for this purpose have been specified elsewhere in these specifications.
- D. Catalog numbers scheduled on the drawings or descriptions of lighting fixtures contained herein may indicate fixture compatibility with certain types of ceiling construction. The Contractor shall determine exact type of ceilings actually to be furnished in each area and shall obtain fixtures to suit, deviating from specified catalog numbers or descriptions only where necessary, and only to the extent necessary to insure fixture-ceiling compatibility. The Contractor shall notify the Architect/Engineer in writing where such changes are to be made. Contractor shall clean all lighting fixtures of dirt and debris upon completion of project prior to requesting substantial completion inspection.
- E. Unless noted otherwise on the drawings, lamps installed in each fixture shall be of the type specifically recommended by the manufacturer of the fixture for use in the fixture. Fixtures shall not be wired with or have any parts constructed using asbestos materials.
- F. All requests for prior approval shall contain the following:
 - 1. Photometric data for each fixture being submitted.
 - 2. For all exterior lighting, point by point foot candle levels shall be submitted. (Exception: Wall packs, ground mounted flood lights, landscape lighting).
 - 3. Listing of all deviations of fixtures proposed as compared to fixtures specified.
 - 4. For interior lighting point by point foot-candle levels shall be submitted for typical interior spaces (offices, classrooms, corridors) and for spaces with indirect and/or specialty lighting.

PART 2 - PRODUCTS

2.1 EMERGENCY BATTERY PACKS

- A. Emergency battery packs shall be provided and installed in all fixtures denoted by the letter "E" appearing at the end of the fixture type designation and where required in the light fixture schedule. Emergency battery packs shall be installed in the ballast/driver housing



(not on top of the fixture) of the fixture(s) unless specifically noted otherwise on the drawings.

- B. At the contractor's option, a central inverter (or multiples thereof) may be provided in the electrical room(s) to provide emergency lighting as indicated. If contractor elects to implement this option, they shall be responsible for providing the appropriate sub-feed breaker in the lighting distribution panel as well as all required sub-feed circuitry. Any and all required generator transfer devices (GTD's) shall be provided at no additional costs. All required branch emergency circuitry shall be provided as well as all branch circuit overcurrent protective devices required in the central inverter(s). As part of the lighting submittal package, fixture supplier shall provide connection diagrams indicating installation requirements for the emergency lighting system showing all switching, inverters (battery packs), GTDs, etc.... required for a complete and fully operational emergency lighting system.

- C. Operation of the fixture shall be as follows:

<u>Normal A/C Power</u>	<u>Switch Position</u>	<u>Operation of Lamps/LED's</u>
On	On	All lamps/LED's operating
On	Off	All lamps/LED's off
Off	On	Emergency Lamps/LED'S all operating
Off	Off	Emergency Lamps/LED's all operating

- D. Emergency operation of the light fixture shall provide a minimum total lamp output of 1200 lumens for a minimum time period of ninety (90) minutes.
- E. Emergency battery packs shall be as manufactured by Bodine, Iota Engineering Co., or approved equivalent.
- F. The Contractor shall be responsible for any additional wiring, conduit, labor, etc., to provide the emergency lighting system specified at no additional cost to the Owner. This includes running of a continuously energized conductor to each and every battery pack.

2.2 LED FIXTURES

- A. Manufacturers of LED luminaires shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.
- B. The use of IESNA LM-80 data to predict luminaire lifetime is not acceptable.
- C. At time of manufacture, electrical and light technical properties shall be recorded for each luminaire. At a minimum, this should include lumen output, CCT, and CRJ. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.
- D. Luminaires shall be provided with a full, non-pro-rated, non-limited, 5-year warranty covering LEDs, drivers, paint and mechanical components.
1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array and electronic driver (power supply).
 2. The rated operating temperature range shall be 30°C to +40°C.

3. Each luminaire is capable of operating above 100°F° (37°C), but not expected to comply with photometric requirements at elevated temperatures.
4. Photometry must be compliant with IESNA LF-79 and shall be conducted at 25°C ambient temperature.
5. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
6. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
7. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL 1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.
8. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
9. Operation Voltage: The luminaire shall operate from a 60 HZ ± 3HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuation of line voltage shall have no visible effect on the luminous output.
10. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
11. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
12. Surge Suppression: The luminaire onboard circuitry shall include fused surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum) SPD shall conform to UL 1449 depending on the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition for category C (standard)). The SPD shall fail in such a way as the luminaire will no longer operate. The SPD shall be field replaceable.
13. Each luminaire shall have integral UL Listed Class II power supplies. Class I power supplies will not be acceptable.
14. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
15. RF Interference: LED drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
16. Drivers shall have a Class A sound rating.
17. Illuminance: The illuminance shall not decrease by more than 30% over the expected operating life. The measurements shall be calibrated to standard photopic calibrations.
18. Light Color Quality: The luminaire shall have a correlated color temperature (CCT) range of 3800K to 4200K. The color rendition index (CRI) shall be 80 or greater. Binning of LEDS shall conform to ANSI/G.NEMA SSL 3-2010.
19. Backlight –Uplight-Glare: the luminaire shall not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical. The luminaire shall not allow more than 2.5 percent of the rated lumens to project above 90 degrees from vertical. Backlight and Glare ratings as per fixture schedule and calculated per IESNA TM-15.
20. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
21. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
22. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

- 23. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- 24. The heat sink shall be aluminum.
- 25. The luminaires shall be dimmable from 100 percent output to 0 percent output.
- 26. Driver shall be integral to the fixture and field replaceable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All surface mounted fixtures shall be properly anchored so that all sides of the fixture are butted up against the mounting surface. A minimum of two (2) anchors shall be used; however, where additional anchors are required to properly install fixture (all sides evenly spaced from ceiling), the Contractor shall provide and install them at no additional cost to the Owner.

- 1. Anchor types shall be as follows:

<u>Mounting Surface Material</u>	<u>Anchor type</u>
* Gypsum board (wall)	Toggle bolts or blocking with screws
Gypsum board (ceiling)	Expansion type anchor
Concrete/concrete block	Expansion type anchor
** Wood	Screws

*Anchor type shall be determined in field by Architect/Engineer as dictated by fixture weight.

** Any fixture installed on combustible material shall be installed on ½ minimum spacers unless prior approved, otherwise in writing by Architect/Engineer.

- B. All recessed fixtures in suspended ceiling shall be supported by a minimum of two (2) support wires, at opposite corners of the fixture. Each support wire shall be continuous without splices to the building structure and separately anchored. Fixture support wires shall support only the light fixture and not the ceiling. Surface mounted fixtures installed on lay-in ceiling shall be supported as lay-in fixtures. Refer to details for additional requirements.

END OF SECTION 26 51 00



SECTION 27 41 16 - INTEGRATED AUDIO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Integrated Audio Systems and Equipment as part of the Work.

1.2 RELATED DOCUMENTS

- A. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this section.
- B. Reference the Project Manual for related specification sections.
- C. Reference the Project Drawings for additional information.

1.3 SECTION INCLUDES

- A. Project instructions for the Contractor and System description details
- B. System product description
- C. Project completion instructions for the Contractor

1.4 RESPONSIBILITY

- A. Responsibilities include, but are not limited to, the following items:
 - 1. Provide materials, equipment, transportation, and labor necessary for a fully working, tested, and calibrated system. Supply accessories and minor equipment items (such as, but not limited to, power strips, adapters, connectors, mounting hardware, etc.) needed for a complete system, even if not specifically mentioned in these Specifications. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.
 - 2. Specifications and drawings are complementary. Work called for by one is binding as if called for by both. Any discrepancies between specifications and drawings shall be brought to the attention of the Architect for clarification during the bidding period. No allowance shall subsequently be made to the Contractor by reason of his failure to have brought said discrepancies to the attention of the Architect.
 - 3. Execute work in accordance with the National Electrical Code (NEC), the National Electrical Safety Code, the Occupational Safety and Health Act (OSHA), applicable State and Local codes, ordinances, regulations, authority having jurisdiction (AHJ), and manufacturer's recommendations. If a conflict develops between the contract documents and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform Work.
 - 4. Required licenses, insurance and permits including payment of charges and fees
 - 5. Verification of dimensions and conditions at the job site.
 - 6. Coordinate location and installation of equipment with other building elements.
 - 7. Preparation of submittal information
 - 8. Pick-up of Owner Furnished Equipment (OFE) and incorporation into project if applicable.

9. Development and implementation of control system software code and control panel layouts, which will become the property of the Owner
10. Final tests and adjustments, written report, and documentation
11. Instruction of operating personnel
12. Provision of manuals
13. Maintenance services and warranty.

1.5 REFERENCES

- A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:
1. American National Safety Institute (ANSI)
 2. American Society of Testing and Materials (ASTM)
 3. Electronics Industries Association (EIA)
 4. Federal Communications Commission (FCC)
 5. National Electrical Manufacturer's Association (NEMA)
 6. National Electrical Code (NEC)
 7. Underwriters Laboratories (UL)
 8. Occupational Safety and Health Administration (OSHA)
 9. Society of Motion Picture and Television Engineers (SMPTE)
 10. Building Industry Consulting Service International (BICSI)
 11. Davis and Davis, Sound System Engineering (3rd Edition) (SSE), Howard W. Sams, 2006
 12. Giddings, Audio System Design and Installation (ASDI), Howard W. Sams, 2013
 13. AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm (AVIH), 2009

1.6 DEFINITIONS

- A. In addition to those Definitions of Division1, the following list of terms as used in this specification shall be defined as follows:
1. Furnish - To purchase, procure, acquire, and deliver complete with related accessories.
 2. Install – To set in place, join, attach, link, set up or otherwise connect together and test until complete before turning over to the Owner, all parts, items, or equipment supplied by Contractor.
 3. Provide – To furnish and install.

1.7 DESCRIPTIONS & REQUIREMENTS

- A. The following is intended to further describe the Work and clarify design intent and is not an exhaustive description of the systems.
1. Audio Network
 - a. All sound systems throughout the stadium and support buildings will operate as a distributed, networked audio system. DSP matrix processors, input/output endpoints, and power amplifiers are located in dedicated IT/AV rooms around the complex. Typical audio controls located in the larger spaces that are expected to have local independent control will be in the form of a touch panel and or keypads.
 2. Stadium (Field and Stands)
 - a. The stadium's sound reinforcement system is designed to deliver high-intelligibility event audio, announcements, and music evenly across the entire field and spectator seating. Loudspeakers are positioned and

oriented to maximize coverage and maintain clarity for both crowd and participant zones. System zoning ensures focus of energy and speech in target areas, minimizing unwanted spill or echo. Signal routing and processing are managed via a central digital backbone, allowing for instant recall of presets for sporting events, ceremonies, or public address.

3. Public Spaces – Concourses
 - a. Concourse zones are equipped with distributed speakers for background music, paging, and emergency notifications. System zoning allows source selection and level control for each area, ensuring clear audio presence without overpowering the environment. Concourse audio may be synchronized with public event messages or adjusted locally for crowd management and operational flexibility.
4. Home Dressing 113
 - a. The Home Dressing Room utilizes ceiling-integrated audio coverage for clear team communication, announcements, and motivational playback. Local level and program source control enables flexible use for meetings, briefings, or relaxation between events. System integration allows paging overrides and privacy where required.
5. Team Lobby 100
 - a. Team lobbies feature ambient sound reinforcement for announcements, pre-game music, and informational broadcasts. Audio zoning allows seamless transition between sources as events change, supporting team arrivals and operational messaging.
6. Conference 103
 - a. Conference spaces are reinforced with discreet speakers and digital signal processing for presentation clarity and audience participation. Acoustic system design supports speech and multimedia needs, with flexible connectivity for microphones, laptops, or conferencing devices. Room modes and presets allow fast changeover between meeting types.
7. Team Store 117
 - a. Meeting rooms employ sound reinforcement for speech intelligibility, presentation support. Input and output points are managed via the central audio matrix, with room presets selectable for focused or general audience use.
8. Meeting Room 124
 - a. Meeting rooms employ sound reinforcement for speech intelligibility, presentation support, and teleconferencing events. Input and output points are managed via the central audio matrix, with room presets selectable for focused or general audience use.
9. Suites 205, 206, 207, 210, 211, 212
 - a. Suites are equipped for private audio delivery of television sound and in-suite announcements. Local volume and source control ensure optimal guest experience for sporting events, meetings, or hospitality functions.
10. Restrooms
 - a. Restrooms feature zoned sound coverage for ambient audio. System design prioritizes audibility and compliance with accessibility and safety standards.
11. Club Area 202, 208
 - a. Club areas are covered by overhead audio for high-quality background music, announcements, and entertainment feeds. System zoning and user control support multipurpose uses, from social events to broadcast audio distribution.
12. Meeting Room 200
 - a. Meeting rooms provide distributed sound reinforcement for speech enhancement and multimedia presentations. Flexible connectivity and input management enable rapid setup for various group functions.

13. Press Box 201
 - a. The press box features dedicated sound reinforcement for event operations, commentary, and media broadcasts, with priority routing for real-time audio feeds to stadium management, staff, and broadcast partners.

1.8 SUBMITTALS

- A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated.
- B. Submittals shall contain sufficient information to describe the Work to be performed. Reviewed shop drawings are to be used for final coordination and construction. Shop drawings must be original work produced by the Contractor responsible for performing the work defined in this specification. Scanning, photographic copying, materially copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.
- C. Supplementary submittal requirements:
 1. Provide the following in one electronic submission for review within thirty days of issuance of Notice to Proceed (NTP) and prior to commencement of Work:
 - a. Complete schedule of submittals.
 - b. Chronological schedule of Work in bar chart form.
 - c. Product Data Sheets:
 - i. Provide a complete table of contents with the following information:
 - ii. Project title.
 - iii. Submittal number. In the case of a resubmittal, use the original submittal number immediately followed by the suffix "R" immediately followed by a unique number and be numbered in consecutive order.
 - iv. Date of submission.
 - v. Provide a list of and Manufacturer's data sheets on products to be incorporated with the Work. Arrange data sheets in the same order they appear in this specification. Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
 - vi. Submit manufacturer's product literature for each type of firestop material to be used. Literature shall include documentation of UL classifications or approved third party testing. Manufacturer's name and number for each part shall be included. Submit drawings of through penetrations, which include the system to be utilized for the firestopping application. Drawing shall indicate construction of wall or floor assembly; size, number and material of penetrating items; firestop system designation; required F-rating, T-rating and remarks.
 - vii. Upon Owners and/or Consultant's request provide (3) three copies of the submittals. Bind submittal in titled three ring D style binders sized for 150 per cent of the material. Maximum size: three-inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

- viii. Submissions that do not follow the format and configuration described above will be returned without review.
- d. Shop Drawings:
 - i. Functional Diagrams/Schematics:
 - 1) Detailed wiring diagrams showing interconnection of components and products, wiring and cabling diagrams depicting cable types and designators, and device designators for each system. Provide connector designations and terminal strip identification, along with color codes for cables connecting to these devices. Give each component a unique designator and use this designator consistently throughout the project.
 - ii. Coordination Drawings:
 - 1) Prepare and submit a set of coordination drawings showing major elements, components, and devices of the audio and video system in relationship with other building components. Prepare drawings to an accurate scale of 1/8"=1'-0" or larger on suitable sized media.
 - 2) Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all equipment. Indicate locations where space is limited, and where sequencing and coordination of installations is of importance to the efficient flow of the Work including but not necessarily limited to the following:
 - a) Equipment housings
 - b) Ceiling and wall mounted devices
 - c) Raceways
 - d) Cabling
- e. Equipment: Location of equipment within racks, consoles, or on tables, with dimensions; wire routing and cabling within housings; AC power outlet and terminal strip locations.
- f. Patch panel(s): Layouts and designation (labeling) strips, including color schemes.
- g. Full fabrication details of any custom enclosures and millwork indicating size, material, finish and openings for equipment.
- h. Structural rigging and mounting details:
 - i. Loudspeaker rigging, suspension, and mounting detail drawings shall be signed and sealed by a professional engineer licensed to practice in the state in which the project is located. The signed and sealed drawings noted above to include the following:
 - 1) Analysis of all components in the load path and attachment method to building structure for suspended loudspeakers.
 - 2) Attachment method for mounting brackets at ceilings, walls, or other building features.
 - 3) Detail the product manufacturer, part numbers, and load capacity of the hardware fittings and materials selected for suspended or mounted loudspeakers.
 - 4) A copy of the design calculations.
 - 5) Secondary steel required for attachment to the building structure.
 - 6) Custom brackets, mounts, suspension grids or trusses, loudspeaker cabinet frames, or loudspeaker brackets.
 - 7) Loudspeaker brackets or mounts provided by the specific loudspeaker manufacturer being installed that do not include traceability data.

- ii. Risk analysis data as referenced in Part 3.2, F
 - iii. Stamping Engineer post-installation sign-off as described in Part 3.2, F
 - iv. Proof of ETCP certification for on-site rigging crew.
- i. Projector, loudspeaker, camera mounting details, include hardware types and load capacity.
- j. Fabricated Plates and Panels
 - i. Provide complete drawings on custom fabricated plates or panels. Drawings shall include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material.
- k. Labeling
 - i. Equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and designator schedule.
- l. Schedules
 - i. Wiring schedule showing source and destination of wiring and indicating which wiring is in conduit. Junction box schedule showing type of box, size, mounting and location. Include this information with remainder of wiring diagrams.
- m. Control System Software
 - i. Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).
- n. IP Addresses
 - i. Coordinated with the venue IT Administrator, provide a list of IP addresses, by device, used in the project.
- o. Consultant's project documents in electronic format will not be supplied to the Contractor for their use as part of submittals.
- p. Detail drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'-0".
- q. Submissions that do not follow the format and configuration described above will be returned without review.
- r. Any other pertinent data which is necessary to provide the Work.
- 2. Control System Software:
 - a. Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).

D. Resubmission requirements:

- 1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
- 2. Indicate all changes that have been made other than those requested.

1.9 CONTRACT CLOSE-OUT DOCUMENTS:

- A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated, after substantial completion but prior to final observation:
- B. Supplementary submittal requirements:
 - 1. Provide the following in one electronic submission for review.
 - a. Equipment Manuals:
 - i. Manufacturer's owner/instruction manual for each type of Product by manufacturer and model or part number unless specified otherwise herein.

- ii. Supply manufacturer's serial numbers for each Product
 - iii. For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item
 - iv. Separately bind list by manufacturer and model or part number of Products incorporated within the Work, arranged in alpha numeric order. When applicable, bind Manufacturer's warranty statements separately.
- b. Test Reports: Recorded findings of Commissioning.
- c. Signed copy of turn over equipment to Owner including quantity, make and model.
- d. Copy of any program or hardware setup files.
- e. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
 - i. This procedure should describe the operation of system capabilities.
 - ii. Assume the intended reader of the manual to be technically inexperienced but unfamiliar with the components and the facility.
- f. Provide Consultant with copy of Owner training video.
- g. Service Information, including service phone number(s) and hours; service schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
- h. Any other pertinent data generated during the Project or required for future service.
- i. Within three (3) weeks of final observation, submit the following in one electronic submission for review. Upon Owners and/or Consultant's request provide (3) three copies of the following:
 - i. Record drawings: Final rendition of Shop Drawings depicting what is actually incorporated within the Work.
 - ii. Hardcopy full size set of Record drawings.
 - iii. Three (3) compact disc or DVD's containing Record drawings in AutoCAD editable DWG format and Adobe PDF format. Resolution to be sufficient to permit Owner's technicians to be able to clearly read all notes and text on screen.
 - iv. One set of signed proof-of-training documents.
- 2. Submittal Format:
 - a. Record Drawings: Drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'-0".
 - b. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in maintenance binding.
 - c. Bind Project Record Manual in titled three ring D style binders sized for 150 per cent of the material. Maximum size: three inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

C. Resubmission requirements:

- 1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
- 2. Indicate all changes that have been made other than those requested.

1.10 CUSTOM SOFTWARE

A. Introduction:

1. Proprietary software provided for the Technical Systems shall be subject to this software license between the Contractor and the Owner as an essential element of the system as defined in the system specification and associated documents, drawings and agreement.
2. Contractor shall agree that 3rd party proprietary software provided with the system shall be subject to this agreement.
3. Contractor and Owner agree that this software license is deemed to be part of, and subject to, the terms of the Agreement applicable to both parties; and shall supersede any standard manufacturer or Contractor's standard license agreement.
4. Proprietary software shall be defined to include, but not be limited to, device and system specific software and firmware designed to run on conventional computer based operating platforms as well as all micro-processor based hardware used to program, setup, or operate the system or its components.
5. For sake of this agreement, MS Windows® shall not be considered "proprietary" software, unless a non-public version of Windows® or any of its components are critical to the operation of the system in which case it shall be deemed proprietary.

B. License Grant and Ownership:

1. Contractor hereby grants to Owner a perpetual, non-exclusive, site license to all software for Customer's use in connection with the establishment, use, maintenance and modification of the system implemented by Contractor. Software shall mean executable object code of software programs and the patches, scripts, modifications, enhancements, designs, concepts or other materials that constitute the software programs necessary for the proper function and operation of the system as delivered by the Contractor and accepted by the Owner.
2. Except as expressly set forth in this agreement, Contractor shall at all times own all intellectual property rights in the software. Any and all licenses, product warranties or service contracts provided by third parties in connection with any software, hardware or other software or services provided in the system shall be delivered to Owner for the sole benefit of Owner.
3. Owner may supply to Contractor or allow the Contractor to use certain proprietary information, including service marks, logos, graphics, software, documents and business information and plans that have been authored or pre-owned by Contractor. All such intellectual property shall remain the exclusive property of Owner and shall not be used by Contractor for any purposes other than those associated with delivery of the system.

C. Copies, Modifications, and Use:

1. Source code shall be available to Owner for a period of not less than 10 years.
2. Owner may make copies of the software for archival purposes and as required for modifications to the system. All copies and distribution of the software shall remain within the direct control of Owner and its representatives.
3. Owner may make modifications to the source code version of the software, if and only if the results of all such modifications are applied solely to the system. In no way does this Software License confer any right for Owner to license, sublicense, sell, or otherwise authorize the use of the software, whether in executable form, source code or otherwise, by any third parties.
4. All express or implied warranties relating to the software shall be deemed null and void in case of any modification to the software made by any party other than Contractor.

D. Warranties and Representations:

1. Contractor represents and warrants to Owner that:
 - a. It has all necessary rights and authority to execute and deliver this Software License and perform its obligations hereunder and to grant the rights granted under this Software License to Owner;
 - b. The goods and services provided by contractor under this Software License, including the software and all intellectual property provided hereunder, are original to Contractor or its subcontractors or partners; and
 - c. The software, as delivered as part of the system, will not infringe or otherwise violate the rights of any third party, or violate any applicable law, rule or regulation.
2. Contractor further represents and warrants that, throughout the System Warranty Period, the executable object code of software and the system will perform substantially in accordance with the System Specifications and Agreement. If the software fails to perform as specified and accepted all remedies are pursuant to the policies set forth in the Specification and in the Agreement. No warranty of any type or nature is provided for the source code version of the software which is delivered as is.
3. Except as expressly stated in this Agreement, there are no warranties, express or implied, including, but not limited to, the implied warranties of fitness for a particular purpose, of merchantability, or warranty of no infringement of third party intellectual property rights.

1.11 QUALITY ASSURANCE

- A. Qualifications: Contractor to be experienced in the provision of systems similar in complexity to those required for this project, and meet the requirements listed below. Provide documentation at the time of bid to support these qualifications:
 1. Form of corporation.
 2. No less than three years' experience with equipment and systems of the specified types.
 3. Experience with at least three comparable scale projects within the last three years.
 4. Be a franchised dealer and service facility for the manufacturer's products furnished.
 5. Maintain a fully staffed and equipped service facility with full-time field technicians.
 6. Have at least one supervisory on-site employee who has completed and has been certified CTS-I by Infocomm.
 7. Supervision of all rigging by an ETCP certified rigger for all work associated with suspension or mounting of overhead equipment.
 8. Adequate plant capacity and equipment to complete the Work.
 9. Adequate staff with commensurate technical experience.
 10. Suitable financial status (i.e., bonding and materials purchase capacity) to meet the obligations of the Work.
 11. Adequate regional service organization to meet warranty response requirements of the Project.
 12. Provide listing with appropriate explanation regarding the status of Contractor's resolved or unresolved legal disputes within the last six calendar years.
 13. Provide listing with appropriate explanation regarding any projects within the last 3 years where the Contractor has failed to meet construction schedules due to Contractor's cause.
 14. Completed current version of the AIA Contractor's Qualification Form.
- B. Subcontractors: at the time of bid, the Contractor shall provide a list of structural, electrical, sound, or any other subcontractors intended to do the Work, or are being retained as local service providers throughout the warranty period. Subcontractors shall be appropriately

state licensed in their specialty and must provide the same qualification documents as the Contractor.

- C. Work: Perform Work in compliance with the applicable standards listed herein and governing codes and regulations of the authorities having jurisdiction and the Contract Documents.
 - 1. Drawings and specification requirements govern where they exceed Code and Regulation requirements.
 - 2. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
 - 3. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.
- D. Coordinate exact location and installation of equipment, power, grounding, and raceway requirements with the Architect.

1.12 DELIVERY, STORAGE & HANDLING

- A. Ship Products in its original container, to prevent damaging or entrance of foreign matter.
- B. Handling and shipping in accordance with Manufacturer's recommendation.
- C. Provide protective covering during construction of all installed devices, to prevent damaging or entrance of foreign matter.
- D. Replace at no expense to Owner, Products damaged during storage, handling or the course of construction.

1.13 PROJECT CONDITIONS

- A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.
- B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to Architect for approval, showing how the work may be installed.

1.14 WARRANTY

- A. Warrant labor and equipment for one year following the date of substantial completion to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or equipment within the Warranty period without charge.
- B. This warranty is in addition to any specific warranties issued by manufacturers for greater periods of time.
- C. Within the warranty period, answer service calls within twenty four (24) hours during normal working hours and correct the deficiency within forty eight (48) hours.
- D. Provide Owner with the name and telephone number of the person to call for service. This information to be part of Project Closeout Documents.

- E. Thirty days prior to the end of the warranty period provide a complete checkout of all system components. Repair or replace any defective equipment discovered during the testing. Correct any defects in wiring or other functional problems reported by Owner. Warranty replacement and service of equipment shall not apply to Owner furnished equipment (OFE). Coordinate observation visit with the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Products quantity is as required. If a quantity is given, provide at least the given amount. Some product listed may not be required to fulfill the obligations of the Work.
- B. Equipment and materials shall be new and conform to applicable UL or ANSI provisions.
- C. Regardless of the length or completeness of the descriptive paragraph herein, provide Products complying with the specified manufacturer's published specifications.
- D. Remove or blank out all manufacturers' names, logos, or other symbols from loudspeakers or other objects placed in view of the public. If logos are removable, remove and repaint to the color of the adjacent surface and reattach.
- E. Take care during installation to prevent scratches, dents, chips, etc.

2.2 ACCEPTABLE MANUFACTURERS

- A. Model numbers and manufacturers included in this specification are listed as a standard of function, performance, and quality.
- B. Refer to General and Supplementary Conditions and Division 1 Specification Sections for equipment substitution procedure.
- C. If a specified product has been discontinued by a manufacturer, provide the replacement model (as certified by the manufacturer) at no additional cost.
- D. Where required provide manufacturer's rack mount adapter or one manufactured by Middle Atlantic or Winstead unless specified elsewhere.

2.3 DIGITAL SIGNAL PROCESSORS AND CONTROL PROCESSORS

- A. Signal processing shall be executed by a network-based DSP matrix mix engine supporting open architecture, ensuring all programmed features, signal paths, and graphical user interfaces (GUI) are retained and fully operational throughout the life of the system.
- B. The system shall provide freely configurable internal signal flow and routing, with matrix cross-points and DSP blocks defined through dedicated control software, enabling the creation of customized audio processing topologies based on application needs.
- C. A software-based interface shall allow for full customization and integration of graphical control panels, scene logic, monitoring, and automation. All DSP units shall be managed and supervised in a common user interface platform—SONICUE Sound System Software—for unified system operation regardless of physical signal processing configuration.

- D. The DSP matrix mix engine shall be fully installed, programmed, integrated, and tested, with all functional capabilities demonstrated and operational at least Thirty (30) days prior to the scheduled first use of the installed AV system.
- E. Digital Signal Processing Unit for audio (DSP Type 1):
 - 1. DSP matrix mix engine with open architecture, supporting flexible routing and mixing for large-scale audio systems.
 - 2. Supports 76 inputs × 72 outputs total, including 12 analog mic/line inputs with 48V phantom power and 8 analog line outputs.
 - 3. Provides 64 × 64 Dante network channels at 96kHz/48kHz sampling, allowing integration with AV-over-IP networked audio.
 - 4. Integrated system controller functionality, with full AES70 protocol support for scalable system supervision and third-party integration.
 - 5. Advanced zone mixing, parametric EQ, FIR drive, compression, room tuning, delay, noise gate, auto mixer, and ducker capabilities—all configurable via SONICUE Sound System Software.
 - 6. Built-in TaskEngine for event automation, scene recall, scheduling, and logic operations.
 - 7. Allows third party plugins Crestron / QSYS
 - 8. Signal to Noise Ratio (A-weighted): greater than 118 dB; THD+N less than 0.002%.
 - 9. Latency: less than 0.22 ms (analog in/out, 96 kHz)
 - 10. Acceptable Product:
 - a. Dynacord – MXE5-64
 - b. Or Approved Equivalent

2.4 AUDIO INTERFACES

- A. Bluetooth with Analog Input Plate (BT):
 - 1. Bluetooth, XLR, and 3.5MM inputs
 - 2. With Dante/AES67 connectivity
 - 3. 2-gang Decora style
 - 4. Acceptable Product:
 - a. AtlasIED WTSD-MIX31K
 - b. With TSD-DAC2i
 - c. Or Approved Equivalent
- B. Balanced Input and Output Plate (ML):
 - 1. XLR Inputs and XLR OutputsDante/AES67 connectivity
 - 2. 2-gang Decora style
 - 3. Acceptable Product:
 - a. Atterotech unDX2IO+
 - b. RDL DD-BN22
 - c. Or Approved Equivalent

2.5 AUDIO SIGNAL PROCESSING

- A. Analog to Digital Audio Converter (ADC):
 - 1. Two channel analog audio input
 - 2. Networked digital audio
 - 3. Acceptable Product:
 - a. Audinate ADP-DAI-AU-2X0
 - b. Or Approved Equivalent

- B. USB to Digital Audio Converter (UDC):
 - 1. USB audio input
 - 2. Networked digital audio
 - 3. Acceptable Product:
 - a. Audinate ADP-USB-2X2
- C. Digital to Analog Audio Converter (DAC):
 - 1. Two channel analog audio output
 - 2. Networked digital audio
 - 3. Acceptable Product:
 - a. Audinate ADP-DAO-AU-0X2

2.6 POWER AMPLIFIERS

- A. Four or eight channel networked DSP power amplifiers with EIA RS-490 power rating at 1% Total Harmonic Distortion (THD) into 8-ohm loads or 70/100-volt constant voltage loads, as applicable.
- B. Advanced on-board supervision and protection, including monitoring of circuitry against input over-drive, short circuits, thermal overload, and over-voltage conditions.
- C. Frequency response: ± 0.25 dB, 20 Hz to 20 kHz with less than one percent Total Harmonic Distortion (THD) at rated output.
- D. Analog Input impedance: 10,000 Ohm balanced.
- E. Signal to Noise Ratio (A-weighted): Amplifier shall achieve greater than 118 dB at rated output power, ensuring exceptional clarity even in demanding audio environments.
- F. Output regulation: 2 dB from no load to full load conditions.
- G. Noise generation: at least 85 dB below rated output with input shorted.
- H. Each channel independently configurable for low-impedance (Lo-Z) or high-impedance (Hi-Z) applications and capable of direct drive operation on each output.
- I. Networked architecture supporting remote monitoring, control, and DSP configuration over Ethernet. Native compatibility with Dante and OCA/AES70 (OMNEO) protocols, fully integrated with SONICUE sound system software and compatible with Crestron/Q-SYS plugins.
- J. Amplifier includes high-resolution 96 kHz DSP, channel matrix mixing, FIR-Drive processing, onboard effects, and system logic automation via TaskEngine.
- K. ghostPOWER feature maintains DSP and Dante network connectivity as well as signal routing independent of mains power, supporting continued operation in critical applications.
- L. Acceptable products:
 - 1. Type 1 (4-channel DSP network amplifier, 1.5kW powerTANK, Hi-Z/Lo-Z, 8x8 Dante, OCA/AES70 remote, PoE ghostPOWER, ecoRAIL, 1RU):
 - a. Dynacord – IX15:4-US
 - b. Or Approved Equivalent

2. Type 2 (4-channel DSP network amplifier, 3kW powerTANK, Hi-Z/Lo-Z, 8x8 Dante, OCA/AES70 remote, PoE ghostPOWER, ecoRAIL, 1RU):
 - a. Dynacord – IX30:4-US
 - b. Or Approved Equivalent
3. Type 3 (8-channel DSP network amplifier, 6kW powerTANK, Hi-Z/Lo-Z, 8x8 Dante, OCA/AES70 remote, PoE ghostPOWER, ecoRAIL, 1RU)
 - a. Dynacord – IX60:8-US
 - b. Or Approved Equivalent
4. Type 4 (DSP power amplifier, 4x1250W, OMNEO/Dante, FIR drive, install-only, 32A powerCON)
 - a. Dynacord – IPX5:4
 - b. Or Approved Equivalent

2.7 LOUDSPEAKERS

- A. Paint all loudspeakers to match surroundings. Confirm color selection with Owner during the submittal phase.
- B. Provide with necessary brackets, tile rails, supports, and other mounting accessories.
- C. Provide custom rigging and mounting as needed.
- D. Exterior loudspeaker cabinets shall be constructed of premium-grade fiberglass or composite materials engineered for permanent outdoor installation, providing consistent performance in harsh environments. Cabinets shall meet or exceed a minimum IP54 rating for ingress protection, offering a documented expected service life of at least 10 years. All exterior and interior surfaces shall receive multi-layer weather-resistant coatings to protect against water, moisture, humidity, and salt exposure. The outer surface finish shall incorporate UV-resistant materials to prevent fading, color shift, or deterioration due to sunlight over time. Enclosure shapes and port orientations shall be designed to minimize the risk of water pooling and allow for rapid drainage, with all seams and joints sealed against the elements. All mounting, rigging, and suspension hardware shall be constructed from corrosion-resistant stainless steel, meeting or exceeding the standards of 304-grade or higher for maximum strength and durability in outdoor environments.
- E. Type 1 Loudspeaker:
 1. 4-inch coaxial in-ceiling loudspeaker, two-way driver configuration.
 2. 130-degree conical coverage pattern.
 3. Selectable 8 Ohm or 70V/100V operation, tap points at 30W, 15W, 7.5W, 3.8W, and 1.9W.
 4. 87dB 1Watt/1meter Sensitivity
 5. 111dB Peak SPL
 6. 65Hz to 20kHz (-10dB)
 7. Bezel-less white magnetic grille, back can enclosure, SwiftLock installation system, tile rails, and mounting ring included.
 8. Acceptable Product:
 - a. Electro-Voice – EVID-C4.2-G2.
 - b. Or Approved Equivalent
- F. Type 2 Loudspeaker:
 1. 6.5-inch coaxial in-ceiling loudspeaker, two-way design.
 2. 120-degree conical coverage pattern.
 3. Selectable 8 Ohm or 70V/100V operation, tap points at 30W, 15W, 7.5W, 3.8W, and 1.8W.

4. 93dB 1Watt/1meter Sensitivity
5. 118dB Peak SPL
6. 55Hz to 17kHz (-10dB)
7. Bezel-less white magnetic grille, back can enclosure, SwiftLock installation system, tile rails, and mounting ring included.
8. Acceptable Product:
 - a. Electro-Voice – EVID-C6.2-G2.
 - b. Or Approved Equivalent

G. Type 3 Loudspeaker:

1. 6.5-inch dual coaxial two-way loudspeaker design (two 6.5" LF drivers, one 1" titanium tweeter).
2. 100 H X 80 V coverage pattern.
3. Selectable 8 Ohm or 70V/100V operation, tap points at 60W, 30W, 15W, 7.5W, 3.8W.
4. 94dB 1Watt/1meter Sensitivity
5. 122dB Peak SPL
6. 62Hz to 20kHz (-10dB)
7. Weather-resistant ABS enclosure, paintable grille, black or white available, Strong-Arm Mount bracket system for versatile installation.
8. Acceptable Product:
 - a. Electro-Voice – EVID-6.2.
 - b. Or Approved Equivalent

H. Type 4 Loudspeaker:

1. 8-inch ceiling subwoofer.
2. 120-degree conical coverage pattern.
3. 8 Ohm or 70V/100V selectable operation, 60W transformer.
4. 93dB 1Watt/1meter Sensitivity
5. 60Hz – 180Hz (-10dB)
6. Bezel-less white magnetic grille, back can enclosure, SwiftLock installation system, tile rails, and mounting ring included.
7. Acceptable Product:
 - a. Electro-Voice – EVID-C8.1S-G2.
 - b. Or Approved Equivalent

I. Type 5 Loudspeaker:

1. 6.5-inch coaxial pendant speaker, horn-loaded Ti-coated tweeter.
2. 115-degree conical coverage pattern.
3. Selectable 8 Ohm or 70V/100V operation, tap points at 30W, 15W, 7.5W, 3.8W, and 1.8W.
4. 87dB 1Watt/1meter Sensitivity
5. 60Hz to 20kHz (-10dB)
6. Bezel-less grille, back can enclosure,
7. Acceptable Product:
 - a. Electro-Voice – EVID-P6.2.
 - b. Or Approved Equivalent

J. Type 6 Loudspeaker

1. Dual 10-inch subwoofer cabinet for installed applications
2. Black enclosure, ultra-low frequency extension
3. Power Rating (Program): 800W

4. Impedance: Stereo Mode: (2) 8ohm; Mono Mode: (1) 4ohm
5. Frequency Range: 33Hz-500Hz
6. Maximum Peak SPL: 120dB
7. Enclosure Material: Medium Impact Polystyrene
8. 8 Ohm or 70V selectable with tap points at 60W, 30W, 15W, 7.5W, 3.75W
9. Acceptable Product:
 - a. Electro-Voice – S10.1DB
 - b. Provide UB-10DB U-bracket for mounting per.
 - c. Or Approved Equivalent

K. Type 7 Loudspeaker

1. Column speaker, 1m (37.4") tall, 12 × 2.5" mid-high drivers.
2. PaSS dispersion control, dual 6.5" woofers
3. Frequency Range: 45 Hz – 16000 Hz (-10dB)
4. 8 ohms nominal impedance
5. 91 dB sensitivity 1w/1m
6. Max SPL: 128 dB
7. Power Rating (Program): 600W
8. 140° horizontal, switchable 25°/45° vertical coverage, 7.5° acoustic down-tilt
9. Impedance: 8 Ohm
10. Acceptable Product:
 - a. Electro-Voice – LRC-2100
 - b. Or Approved Equivalent

L. Type 8 Loudspeaker:

1. High-output 15-inch low-frequency driver and 3-inch titanium diaphragm compression driver on a rotatable 90° x 40° Constant Directivity waveguide.
2. Front-loaded transducers in a weatherized, vented rectangular birch/fiberglass enclosure.
3. Nominal coverage: 90° horizontal × 40° vertical (rotatable).
4. Impedance: 8 Ohm
5. 100dB 1Watt/1meter Sensitivity
6. 137dB Peak SPL
7. 49Hz to 20kHz (-10dB)
8. Weather-resistance: Full fiberglass enclosure, marine-grade hardware, certified for outdoor direct exposure (IP55/IP54 per EV documentation).
9. Acceptable Product:
 - a. Electro-Voice – EVF-1152D/94-FGB
 - b. Provide EVF-UB-BLK U-bracket for mounting per.
 - c. Or Approved Equivalent

M. Type 9 Loudspeaker:

1. High-output 12-inch LF driver and 3-inch titanium compression driver, rotatable 120° x 60° Constant Directivity horn.
2. Nominal coverage: 120° horizontal × 60° vertical (rotatable).
3. Impedance: 8 Ohm
4. 100dB 1Watt/1meter Sensitivity
5. 134dB Peak SPL
6. 55Hz to 20kHz (-10dB)
7. Weather-resistance: Full fiberglass enclosure, marine-grade hardware, certified for outdoor direct exposure (IP55/IP54 per EV documentation).
8. Acceptable Product:
 - a. Electro-Voice – EVF-1122D/126-FGB

- b. Provide EVF-UB-BLK U-bracket for mounting per.
- c. Or Approved Equivalent

N. Type 10 Loudspeaker:

- 1. 15-inch low-frequency driver and 3-inch titanium compression driver, Constant Directivity 60° x 40° horn.
- 2. Front-loaded, horn mouth includes fiberglass protection, marine-grade network, and hardware.
- 3. Nominal coverage: 60° horizontal x 40° vertical (rotatable).
- 4. Impedance: 8 Ohm
- 5. 102dB 1Watt/1meter Sensitivity
- 6. 139dB Peak SPL
- 7. 60Hz to 20Hz (-10dB)
- 8. Weather-resistance: Full fiberglass enclosure, IP55/IP54, outdoor direct exposure certified.
- 9. Acceptable Product:
 - a. Electro-Voice – EVH-1152D/64-FGB
 - b. Or Approved Equivalent

O. Type 11 Loudspeaker:

- 1. Dual 18-inch (2 x 18") front-loaded, high-output subwoofer system.
- 2. Front-loaded components in a rugged weatherized black fiberglass enclosure for permanent install applications.
- 3. Nominal coverage: Omnidirectional, suitable for supplementing low-frequency support in high-output systems; typically paired with controlled-coverage main speakers.
- 4. Impedance: Stereo Mode: (2) 8ohm; Mono Mode: (1) 4ohm (for use with Dynacord IPX 20:4)
- 5. 105dB 1Watt/1meter Sensitivity
- 6. 147dB Peak SPL
- 7. 28 Hz to 200 Hz (-10dB)
- 8. Weather-resistance: Outdoor direct exposure rated, fiberglass construction, recommended for permanently installed environments
- 9. Acceptable Product:
 - a. Electro-Voice – X12I-128-FGB
 - b. Or Approved Equivalent

2.8 USER INTERFACES

A. Touch Panel (TP, Type 1):

- 1. 5.7" IPS flush-mount touch panel display for wall installation.
- 2. 720 x 1440 pixel resolution, 16.7 million colors, 450 nits brightness.
- 3. IEEE 802.3af Power over Ethernet (PoE) via RJ45 LAN, ultra-slim profile for US, EU, UK boxes
- 4. Secure mounting plate, designed for theft protection. Operating range 0°C to +45°C, max 95% humidity.
- 5. Fully customizable SONICUE graphical interface, local language support, proximity sensor activation, universal mounting.
- 6. Acceptable Product:
 - a. Dynacord TPC-1
 - b. Or Approved Equivalent

B. Wall Controller Keypad (KP Type 1)

1. Networked audio wall controller with 1.8" color display, rotary encoder for parameter selection and preset recall.
2. IEEE 802.3af Power over Ethernet (PoE) connectivity for streamlined installation.
3. Fully customizable SONICUE compatibility – supports programmable layouts for volume, source selection, and preset functions.
4. Acceptable Product:
 - a. Dynacord WPN1-US
 - b. Or Approved Equivalent

2.9 POWER SYSTEMS

A. Remote Power Sequencing Systems

1. Remote Power Sequencing (RPS) system to be operated via low voltage button contact closures from either push buttons located on panels local to the event space or via a contact closure from a relative control system (DSP, Control Processor, etc.)
2. Devices to be sequenced "ON" in order of signal flow. Devices and equipment to be shut down in reverse order from "ON" sequence. Example "ON" order starting with:
 - a. Source devices. (Media Players, Pre-amplifiers, etc.)
 - b. Processing devices (DSP, Mixers, Video Switchers, etc.)
 - c. Output devices (Amplifiers, Powered Speakers, etc.)
3. Devices not to be sequenced and to remain on for status and monitoring purposes to include but not limited to:
 - a. Network switches and components.
 - b. Equipment housing ventilation systems.
 - c. Control system equipment responsible for providing control of Remote Power Sequencing system.
4. Coordinate wiring of high voltage components with electrical contractor.

B. Power Protection (SURGE):

1. Provide surge protection device to maintain clean power to the following equipment:
 - a. DSP devices
 - b. Computer CPU's, Monitors and KVM switch, DSP analog to digital converters
 - c. Fiber Transport system components
 - d. All UPS backup power supplies
 - e. Acceptable products:
 - i. Surge-X SX-1120RT
 - ii. Middle Atlantic PD-920R-SP

C. Backup Power (UPS):

1. Provide UPS systems to maintain power to all computer CPU's, associated video monitors and KVM switch components.
2. Provide UPS system for all Digital Signal Processing (DSP) units.
3. UPS's shall be on-line style with sufficient battery reserve to operate for 15 minutes. Size each UPS unit for 25% additional capacity.
4. 2-RU Rack mountable.
5. Acceptable product:
 - a. APC Smart-UPS 2200 Series SUA2200RM2U.

- b. Or approved equivalent
- D. Horizontal Rack Power Strip (POWER DIST):
 - 1. 20 Amp/2400-Watt rating
 - 2. Front panel AC voltmeter.
 - 3. Spike and surge suppression with over-voltage shutdown
 - 4. 1-U Rack Mountable
 - 5. Acceptable product:
 - a. Furman PM-Pro Series II
 - b. Juice Goose RP-200
 - c. Middle Atlantic PD-920R
- E. Rack Lighting and Power Strip (PWR-LIGHT):
 - 1. Nema 20A plug
 - 2. 20 Amp/2400-Watt rating
 - 3. Front panel AC voltmeter
 - 4. Dual front panel pullout dimmable lights
 - 5. Spike and surge suppression with over-voltage shutdown
 - 6. Rack Mountable
 - 7. Acceptable Product:
 - a. Furman PL-Pro C
 - b. Middle Atlantic PDLT-815RVA
 - c. Juice Goose JG 8LED

2.10 EQUIPMENT HOUSING AND ACCESSORIES

- A. Free Standing Gangable Equipment Racks (ER, Type 1):
 - 1. Type: Frame and panel with locking rear door.
 - 2. Size: 32-inches deep with 45 units of vertical space.
 - 3. Construction: Factory assembled 16-gauge cold-rolled steel frames with all corners welded.
 - 4. Black enameled finish.
 - 5. Provide all necessary side panels, trim pieces, tops, and blank panels.
 - 6. Provide Middle Atlantic VBK-BGR Vent Blocker kit(s) and configure for proper airflow and cooling of rack.
 - 7. Acceptable product:
 - a. Middle Atlantic Products BGR series
 - b. Or approved equivalent

2.11 CABLES & WIRING

- A. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper, and meet appropriate ratings (e.g. CMR, CMP, etc.)
- B. Cable shall carry appropriate fire rating (e.g. CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
- C. Where cables are routed through cable tray, provide tray rated cable of equal specification.
- D. Where speaker cables are run exposed through a return air plenum, provide plenum rated cable of equal specification.

- E. Shielded cables located in raceways shall have aluminum foil shield with drain wire.
- F. The Belden cables listed below are approved for use on this project and are listed to set the acceptable standard of performance. If field conditions or actual cable pathway requires tray or plenum cable, provide version of cable that meets required rating. Cables from Liberty, Commscope, Gepco, and West Penn are also acceptable provided they meet the performance specifications of the approved listed cables.
- G. Loudspeaker Cables - 70.7 Volt:
 - 1. Homerun to Amp: 14 gauge twisted pair, jacketed. Belden 5100UP
 - 2. Volume Control to Speaker: 16 gauge twisted pair, jacketed. Belden 5200UP
 - 3. Speaker to Speaker: 16 gauge twisted pair, jacketed. Belden 5200UP
 - 4. Acceptable Manufacturer:
 - a. Belden (Model number listed above)
- H. Loudspeaker Cable - 8 Ohm, 16 Ohm, 4 Ohm:
 - 1. Provide 14 AWG cable
 - 2. Cable to be CL3R or CL2P rated
 - 3. Jacket color: gray
 - 4. Acceptable Product:
 - a. West Penn 226
 - b. West Penn 25226 (where required)
- I. Multi-pair Audio Cable:
 - 1. 24 AWG, individually shielded, individually jacketed with overall jacket.
 - 2. Can be used in lieu of Belden 9451 where multiple cable runs to the same location are needed.
 - 3. Acceptable Product:
 - a. Belden 15##C Series
- J. XTP/DTP Twisted Pair Cable:
 - 1. Shielded Twisted Pair:
 - a. Meets HDBT requirements.
 - b. 475 MHz up to 330 feet (100 m)
 - c. 24 AW solid copper construction
 - d. SF/UTP design
 - e. Acceptable Product:
 - i. Extron XTP DTP 24/1000 - 22-236-03
 - ii. Extron XTP DTP 24P/1000 - 22-235-03 (where required)

2.12 CONNECTORS

- A. Panel Mounted Connectors:
 - 1. Accepted Product:
 - a. Type XLR-3M:
 - i. Neutrik NC3MD-L-B-1.
 - ii. Switchcraft E3MSCBAU.
 - iii. Amphenol AC3MMDZB-AU.
 - b. Type XLR-3F:
 - i. Neutrik NC3FD-L-B-1.
 - ii. Switchcraft E3FBAU.

- iii. Amphenol AC3FDZB-AU.
 - c. Type XLR-5M:
 - i. Neutrik NC5MD-L-B-1.
 - ii. Switchcraft E5MSCBAU.
 - iii. Amphenol AC5MDZB-AU.
 - d. Type 1/4" Phone:
 - i. Neutrik NJ3FP6-C.
 - ii. Switchcraft E111BL.
 - e. Type SPEAKON:
 - i. Neutrik NL4MP.
 - ii. Switchcraft HPCP410F.
 - iii. Amphenol SP-4-MD.
 - f. Type 1/4" Speaker:
 - i. Neutrik NJ3FP6-C.
 - ii. Switchcraft E111L.
 - g. Type BNC:
 - i. Neutrik NBB75DFI.
 - ii. Switchcraft EHBNC2RB.
 - iii. Amphenol AC-BNC-PJ-75B.
 - h. Type NCJ:
 - i. Neutrik NCJ6FI-S.
 - ii. Amphenol ACJC6S.
 - i. Type RCA:
 - i. Neutrik NF2D-2 (Right) and NF2D-9 (Left).
 - ii. Switchcraft BPJJ02AUX (Right) and BPJJ04AUX (Left).
 - iii. Amphenol ACJD-RED (Right) and ACJD-WHT (Left).

B. Cable Mounted Connectors:

- 1. Accepted product:
 - a. Type XLR-3MP:
 - i. Neutrik NC3MX-B.
 - ii. Switchcraft AAA3MBAUZ.
 - iii. Amphenol AX3MB-AU.
 - b. Type XLR-3FP:
 - i. Neutrik NC3FX-B.
 - ii. Switchcraft AAA3FBAUZ.
 - iii. Amphenol AX3FB-AU.
 - c. Type XLR-5MP:
 - i. Neutrik NC5MX-B.
 - ii. Switchcraft AAA5MBAUZ.
 - iii. Amphenol AX5MB-AU.
 - d. Type XLR-5FP:
 - i. Neutrik NC5FX-B.
 - ii. Switchcraft AAA5FBAUZ.
 - iii. Amphenol AX5FB-AU.
 - e. Type XLR-3MP Right Angle:
 - i. Neutrik NC3MRX-B.
 - ii. Switchcraft R3MBAUZ.
 - iii. Amphenol AC3MMR.
 - f. Type XLR-3FP Right Angle:
 - i. Neutrik NC3FRX-B.
 - ii. Switchcraft R3FBAUZ.
 - iii. Amphenol AC3FR.
 - g. Type TRS:

- i. Neutrik NP3X-B.
 - ii. Amphenol TS3P.
- h. Type 1/4":
 - i. Neutrik NP2X-B.
 - ii. Amphenol TM2P.
- i. Type RCA:
 - i. Neutrik NF2C-B/2.
 - ii. Switchcraft 3502ABAU.
 - iii. Amphenol ACPR-S(XX).
- j. Type Speakon:
 - i. Neutrik NL4FC.
 - ii. Switchcraft HPCC4F.
 - iii. Amphenol SP-4-F.
- k. Type BNC:
 - i. Provide correct impedance connector for circuit type.
 - ii. Kings. Verify part number with cable selected.
 - iii. Trompeter. Verify part number with cable selected.
 - iv. Amphenol. Verify part number with cable selected.
 - v. Type BNC for Word Clock using VHD2000M cable:
 - 1) Kings 2065-2-9.
 - 2) ADC BNC-1.
 - 3) Gepco BNC-XL-2.
 - vi. Type BNC for Word Clock using VHD1100 cable:
 - 1) Kings 2065-8-9.
 - 2) ADC BNC-25.
 - vii. Type BNC for wireless microphone antenna cables:
 - 1) Provide 50-ohm connectors.
 - 2) Provide appropriate connector for cable type and diameter from these manufacturer's:
 - a) Amphenol
 - b) RF Industries
 - c) Times Microwave
 - d) Belden
 - e) West Penn
 - viii. Type BNC for assisted listening antenna cables:
 - 1) Provide 50-ohm connectors.
 - 2) Provide appropriate connector for cable type and diameter from these manufacturer's:
 - a) Amphenol
 - b) RF Industries
 - c) Times Microwave
 - d) Belden
 - e) West Penn

2.13 SPEAKER HARDWARE AND SUPPORT STRUCTURE

- A. Provide a custom engineered loudspeaker hardware system as required to mount and suspend speakers in the arrangement as shown on the Drawings.
- B. Attachment system to be supplied by vendor whose primary specialty is fabricating support systems for loudspeakers or similar devices over an audience.
- C. Provide safety cable on all bracket mounted loudspeakers.

- D. Provide auxiliary support steel and hardware required to attach to building structure and design members to have a minimum safety factor of at least 7:1. Reference architectural and structural documentation for details on structural elements.
- E. All wire rope used for loudspeaker suspension to have a minimum safety factor of 10:1.
- F. Fabricate all components from powder coated aluminum for maximum resistance to corrosion.
- G. Contractor is responsible for painting any welds associated with this Work. This includes bracket attachment points and welds required to attach bracketing to building structure, scoreboards, or poles.
- H. Acceptable manufacturer:
 - 1. ATM Flyware / Allen Products
 - 2. Whirlwind Metal Fabrication (U-Brackets Only).
 - 3. Custom Engineered by Contractor (reference submittal requirements for additional information).
- I. Shoulder Type Machinery Eye Bolts:
 - 1. Forged Steel – Shoulder, Quenched and Tempered.
 - 2. Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles.
 - 3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
 - 4. Select size of product-based working load limits required.
 - 5. Acceptable product:
 - a. Crosby Group S-279 / M-279 Series.
 - b. Chicago Hardware Company 261 Series.
- J. Forged Eye Nuts:
 - 1. Forged Steel – Quenched and Tempered.
 - 2. Tapped with standard UNC class 2 threads after galvanizing.
 - 3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
 - 4. Select size of product-based working load limits required.
 - 5. Acceptable product:
 - a. Crosby Group G-400 Series.
 - b. Chicago Hardware Company 167 Series.
- K. Anchor Shackles:
 - 1. Forged - Quenched and Tempered, with alloy pin.
 - 2. Working Load Limit permanently shown on every shackle.
 - 3. Hot Dip galvanized or Self-Colored.
 - 4. Product to meet the performance requirements of Federal Specification RR-C-271D Type IVA, Grade A, Class1.
 - 5. Select size of product-based working load limits required.
 - 6. Provide all screw pin type shackles with mouse wire.
 - 7. Acceptable product:
 - a. Crosby Group G-209 / S-209 Series Screw Pin.
 - b. Chicago Hardware Company 201 Series.

L. Turnbuckles:

1. Acceptable turnbuckle assembly combinations include Eye and Eye, Jaw and Jaw, Jaw, and Eye.
2. End fittings are Quenched and Tempered; bodies heat treated by normalizing.
3. Hot Dip galvanized.
4. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
5. Product to meet the performance requirements of Federal Specifications FF-T-791b, Type 1 Form 1 - CLASS 4, and ASTM F-1145.
6. Select size of product-based working load limits required.
7. All end fittings to be moused to the body with mousing cable.
8. Acceptable product:
 - a. Eye and Eye:
 - i. Crosby Group HG-226 Series.
 - ii. Chicago Hardware Company 012/013 Series.
 - b. Jaw and Eye:
 - i. Crosby Group HG-227 Series.
 - ii. Chicago Hardware Company 026 Series.
 - c. Jaw and Jaw:
 - i. Crosby Group HG-228 Series.
 - ii. Chicago Hardware Company 030/031 Series.

M. Swivel Hoist Ring:

1. All components are Alloy Steel - Quenched and Tempered.
2. Rated at 100% of Working Load Limit at 90° angle.
3. 360 swivel and 180 pivot action.
4. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements.
5. Bolt specification to be Grade 8 Alloy socket head cap screw to ASTM A 574.
6. Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles.
7. Zinc Plated (Yellow Chromate) finish for increased corrosion protection.
8. Select size of product-based working load limits required.
9. Acceptable product:
 - a. Crosby Group HR-125.
 - b. Chicago Hardware Company 860 Series.

N. Wire Rope Thimble:

1. Product to meet the performance requirements of Federal Specification FF-T-276b Type II.
2. Hot Dip galvanized.
3. Select size of product-based wire rope size required for suspended load.
4. Acceptable product:
 - a. Crosby Group G-411 Series.
 - b. Chicago Hardware Company 224/225 Series

O. Wire Rope:

1. Strands: 7 x 19 Utility Cable.
2. Type: Galvanized.
3. Select size of product-based working load limits required.
4. Acceptable product:
 - a. WireCo Union

- b. McMaster-Carr
- c. Samson Rope Technologies

P. Wire Rope Sleeves:

- 1. Type: Copper Duplex.
- 2. Select size of product-based wire rope size required for suspended load.
- 3. Acceptable product:
 - a. WireCo Union
 - b. McMaster-Carr
 - c. Samson Rope Technologies

PART 3 - EXECUTION

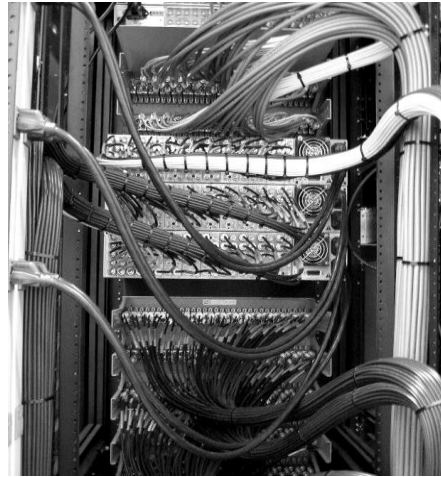
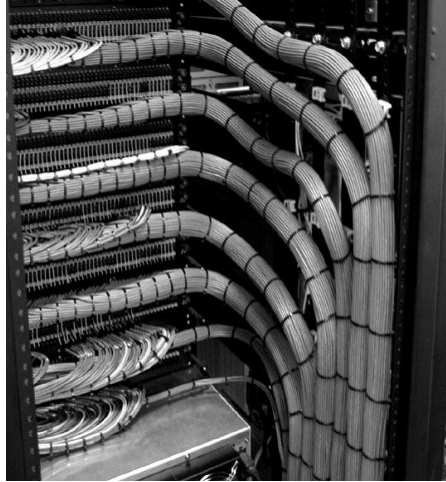
3.1 GENERAL

- A. Coordinate incorporation of the Work specified herein with other project work so as to facilitate a cohesive final Products.
- B. The installation recommendations contained within ASDI and Telecommunications Distribution Methods Manual are mandatory minimum standards and requirements.
- C. Mount equipment and enclosures plumb and level.
- D. Permanently installed equipment to be firmly and safely held in place. Design equipment supports to support loads imposed with a safety factor of at least five. Seismic bracing shall be installed on appropriate equipment where local codes require such installation.
- E. Verify all locations of equipment in all rooms with Owner's Representative, Owner, and Consultant.

3.2 INSTALLATION

- A. Installation of cable and wiring
 - 1. Cabling and Wiring:
 - a. Install cable in a manner to adhere to manufacturer's specifications for maximum cable pulling tension, minimum bend radius, and restrictions.
 - b. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.
 - c. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall the cables rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe and/or HVAC system ducting.
 - d. Horizontal distribution cables shall be bundled in groups of no more than 50 cables when being supported by J-Hook or trapeze systems. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance. An exception to this rule is when cable is installed in cable tray systems.
 - e. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices

- f. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
 - g. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner.
 - h. Cables shall be identified by a self-adhesive machine label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
 - i. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
 - j. Provide splice free wiring and cabling from origination to destination. Cables shall be installed in continuous lengths from origin to destination (no splices). Properly designed transition points, or consolidation points are not considered 'splice' points.
 - k. Make joints and connections with rosin-core 60/40 solder or with mechanical connectors specifically intended for the type and class of cable being used. Where spade lugs are used, crimp properly with ratchet type tool.
 - l. Take precaution to prevent and guard against electromagnetic and electrostatic hum. For line-level audio signal, float cable shield at one end. Shield not connected to be folded back over cable jacket and covered with heat-shrink tubing. Do not cut off unused shield.
 - m. Isolate cables and wires of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation in any amplifier section. Keep wiring separated into groups for microphone level circuits, line level circuits, loudspeaker circuits, and power circuits.
 - n. Connect cable to active components through XLR connections whenever multiple formats are available. Make connections to speaker transformers with properly sized closed end connectors crimped with factory approved ratchet type tool. Wire nut or "Scotchlock" connectors are not acceptable. Do not wrap audio cable splices or connections with adhesive backed tape.
 - o. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommeting.
 - p. Execute wiring in strict adherence to:
 - i. Phillip Giddings. Audio System Design and Installation. Indianapolis: Howard W. Sams & Co., 1990.
 - ii. Don Davis and Carolyn Davis. Appendix II, Recommended Wiring Practices. Sound System Engineering, 2nd Edition. Indianapolis: Howard W. Sams & Co., 1989.
 - iii. AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm, 2009
2. Equipment Housing Cabling and Wiring:
- a. Lace, tie, or harness wire or cable as required herein, and in accordance with accepted professional practice. Dress, lace or harness all wire or cable to prevent mechanical stress on electrical connections; no wire or cable shall be supported by a connection point. Install cable and wire neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable bundles sag. Reference photos below for standard of quality.



- b. Provide adequate service loops so that equipment mounted on rack slides may be pulled fully out, to their locked position without straining cable.
- c. Neatly bundle excess AC power cable from housing mounted equipment with plastic cable ties.
- d. Provide plastic cable ties or Velcro straps to bundle cabling and wiring. Electrical tape and adhesive backed cable tie anchors are not acceptable.
- e. Install with connections completely visible and labeled.
- f. Provide termination resistors, if required, of 5 per cent tolerance; fully visible and not concealed.

B. Installation of connectors, plates & panels:

1. Install panel mounted connectors rigidly attached to panels, plumb and level.
2. Custom rack panels shall be 1/8 inch thick aluminum, standard EIA sizes, brushed black anodized finish (brushed in direction of aluminum grain only), unless otherwise noted.
3. Custom connector plates (speaker, microphone, etc.) are typically stainless steel, unless otherwise noted or specified. However, verify plate finish with Architect.
4. Install XLR type connectors in accordance with IEC-268 standard, with a wiring scheme of pin 2 hot (high), pin 3 (low), and pin 1 screen (shield).
5. Other Plates and Panels may be required to satisfy the requirements of the Work.

C. Installation power and grounding:

1. Coordinate final connection of power and ground wiring to housings.
2. Hardwire power wiring directly to internal AC receptacles to ensure uninterrupted operation.
3. Provide 3-conductor, isolated ground, 120 VAC outlets as required within each housing. Provide a minimum of two spare outlets in each rack.
4. Provide a copper ground buss top to bottom in each housing, insulated from the housing. Ground equipment chassis not having a three wire power cord to these busses using 6/32 nuts, bolts and lock-washers with No. 12 wire. Connect green ground wire from each AC outlet in housing to this buss bar.
5. Replace manufacturers supplied 18 gauge IEC power cords with UL listed 18 gauge pre-molded 6", 12", 18", or 24". Use minimum length required. No looped or cable tied IEC power cords will be permitted within the equipment rack.
6. Replace manufacturers supplied 14 gauge IEC power cords with UL listed 14 gauge pre-molded 18" or 36" for all equipment IEC capable. Use minimum length

required and minimize looped or cable tied IEC power cords present in the equipment rack.

D. Installation of electronic equipment:

1. Take appropriate precautions against electrostatic discharge (ESD). Establish a personal ground before handling electronic equipment through the use of a grounded wrist wrap and/or an anti-static floor pad.
2. Take appropriate precautions to protect the equipment from damage during installation. Equipment to be installed free of damages, scratches, dents, etc.
3. Mount trim potentiometers, custom circuit cards, relays, and transformers (except large 70V units) in shielded enclosures, and mark their function and connections with engraved lamicoïd labels.
4. Mount equipment plumb and level, firmly and safely held in place.

E. Installation of Equipment Housing:

1. Mount equipment in racks and consoles and fully wire and test before delivery to job site. If field conditions prevent prior assembly of racks, notify Owner in writing that racks will be fabricated on site and the reasons for the change.
2. Secure rack mounted devices utilizing all available fastener mounting positions on device.
3. Provide rear support for housing mounted equipment greater than 15 inches deep.
4. Provide blank panels to fill unused panel space within the equipment housing.
5. If Key door locks are required, key each housing type alike.
6. Looking at the rack from the rear, locate AC power and speaker wiring on the left; line level audio, video, and RF wiring on the right.
7. Provide shaft locks or security covers on non-user operated equipment having front panel controls. These panels are to be installed at the conclusion of testing.
8. If forced air active thermal management is used, provide ventilation blocking material on the front, sides, and rear of the equipment rack as needed. Reference Middle Atlantic Products "Controlling the Temperature Inside Equipment Racks".
9. Panels or equipment mounted on the rear rack rails shall not block access to any front mounted components.
10. If equipment rack is not equipped with casters, provide two inch high wood base to isolate equipment rack from floor. Wood base should be capable of supporting the load.

F. Installation of Loudspeakers:

1. The Contractor is responsible for final design and engineering of loudspeaker rigging, attachments, brackets, and hoisting.
2. Loudspeakers shall be mounted at the operating position in a safe, secure, and permanent manner.
3. Provide custom rigging as needed.
4. Suspension and Mounting:
 - a. Static and dynamic equipment loads shall be suspended or mounted in compliance with the following ANSI/ESTA standards, using the latest available versions of the standards:
 - i. ANSI E1.4-2-2021 Statically Suspended Rigging Systems
 - ii. ANSI E1.56-2018 Rigging Support Points
 - iii. ANSI E1.6-1-2021 Powered Hoist Systems
 - iv. ANSI E1.8-2012 Loudspeaker Enclosures Intended for Overhead Suspension
 - b. Rigging, mounting, and support systems for overhead suspended loudspeakers shall be reviewed and certified by a registered Professional

Engineer (PE), in the employ of the Contractor, licensed to practice in the State in which the project is located. Documentation shall be included as a submittal item. Once the systems are installed, the PE shall physically inspect, at the Contractor's cost, the methods and means used to verify compliance with the original design.

5. General Guidelines:

- a. Paint loudspeakers, supports, and related hardware color as directed by the Owner.
- b. The aiming direction of all loudspeakers shall be adjustable by no less than ± 5 degrees horizontally and vertically.
- c. Loudspeakers are to be oriented parallel to their mounting surface unless otherwise noted.
- d. Provide a safety cable connected to a secondary location for each loudspeaker.
- e. All loudspeakers located in ceiling tiles shall be located in the center of the tile unless noted otherwise.
- f. Paint loudspeakers to match surroundings. Confirm color selection with the Architect during the submittal phase.
- g. Exterior loudspeaker cabinets shall be constructed of materials designed for permanent outdoor exposure conditions with a minimum IP 54 rating, and a minimum expected 10-year life span. Exterior and interior surfaces of the cabinets shall be protected from the effects of water, moisture, and humidity. The exterior surface shall also be protected from the effects of ultraviolet radiation to prevent fading and color change. The cabinets shall be shaped and oriented in a manner that minimizes the possibility of water pooling on any cabinet surface. Associated hardware shall be inherently non-corrosive, performing to the standards of 304 Stainless Steel or higher.

G. Installation of Projectors:

1. Confirm distance of specified projection lens before mounting projector.
2. Projectors shall be mounted plumb and level at the operating position in a safe, secure and permanent manner.
3. All hardware required to locate the mount and projector at the required location shall be provided.
4. Projectors shall be mounted using tamper proof secure hardware.
5. Contractor may be required to adjust projection screen and lift upper and lower limit switches for projection screens and lifts specified elsewhere and not installed as part of this Contract.

H. Installation of Flat Panel Monitors:

1. Confirm location before mounting.
2. Monitors shall be mounted plumb and level at the operating position in a safe, secure and permanent manner.
3. All hardware required to locate the mount and monitor at the required position shall be provided.
4. Locate monitor on the center line of the room unless noted otherwise.

I. Loose Equipment

1. Provide loose equipment as indicated on drawings.
2. Unpackage and assemble items.
3. Place items in designated storage or refer to Owner for direction on final location and storage of loose equipment.

3.3 FIRESTOP

- A. A fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.
- C. Fire-stop systems shall be reviewed by a Professional Engineer (PE) licensed to practice in the State in which the project is located. Stamped drawings showing the fire stop systems shall be included as a submittal item. Once the systems are installed, the engineer of record for the firestop system shall physically inspect the methods and means used to verify compliance with the original design.
- D. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the fire-stop system(s).
- E. All fire-stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for observation by the local authorities prior to cable system acceptance.

3.4 CONTROL SYSTEM PROGRAMMING

- A. Transport Control
 - 1. Provide standard Stop, Play, Pause, Fast Forward and Rewind for each playback device and menu control for DVD players. Buttons should be arranged in a conventional fashion that will be familiar to the normal user.
 - 2. The selected control function should be displayed by showing the appropriate button "pressed". It should remain this way until another function is selected.
 - 3. For devices that will go into a standby mode after a period of time, the control system shall sense this mode and restore normal operating mode once a transport function has been selected. This may require the use of current sensors to determine the state of the unit. No direct user action should be required at the playback device to restore the normal operating mode.
- B. Screen/Shade Control
 - 1. In addition to up-down functions, provide a Stop function to allow the movement to be halted. Once movement has been stopped, the up or down buttons should resume travel in the selected direction.
 - 2. Control system shall not prevent screen/shade wall controls from being used as well.
 - 3. Touch panel controls should be readily accessible to the user to permit direct control of shades or screen with having to navigate through multiple control pages.
- C. Room Combining
 - 1. Combining of adjacent areas shall be done through a graphical representation of the physical areas to be combined. Use of a floor plan metaphor is recommended with the graphic oriented correctly with respect to control panel location.

2. Use buttons or other appropriate objects placed along the common wall to enable the combining function.
3. When spaces are combined, the graphic appearance of those areas shall change to reflect this configuration. Once an area is separated from a combination, the color of its area should revert to the normal room color.
4. Common control functions between combined rooms shall be linked, allowing control of the combined area from any one of the touch panels. Examples of common functions include:
 - a. Background music selection,
 - b. Background music volume
 - c. Background music muting
 - d. Lighting preset recall
 - e. Master volume (not individual channel volume)
5. When combining adjacent rooms, the control system shall force the common functions to a predetermined default configuration so all rooms have the same configuration.
6. To avoid unintentional changes, a control panel will not be able to operate a function in a remote location without also operating that same function in the room where the panel is located.

D. Level Control

1. Objects requiring level adjustment such as volume or tone controls shall be through Up/Down buttons with a graphical representation of the actual level.
2. Increment of level change to be adjusted for reasonable range without the need to push the Up or Down buttons needlessly.

E. Volume Mute

1. Where the ability to mute the sound is needed, the button shall use the label "Vol On" and "VOL OFF" instead of Mute and Unmute. When in a "VOL OFF" mode, pushing the "VOL UP" button shall restore the sound and bring the system out of the muted mode.
2. VOL ON/OFF buttons shall change color to indicate the status of the button.

F. Standard Colors

1. Control functions shall be color coded to add clarity and show relationships between different groups of controls.
2. The color Red shall be reserved to indicate a fault or abnormal condition.
3. Green may be used to indicate normal operation, but may be used for standard control colors as well.
4. Similar controls should maintain the same color scheme across all control pages.
5. When a function is selected, the graphical depiction of that button should appear to be pressed and its color change to a darker shade of the regular button color.
6. Color schemes used for background and foreground objects should be selected to be complimentary and provide a consistent theme throughout the control pages.

G. Minimum Button Size and Placement

1. Minimum visual size of a button is 3/8" wide by 1/4" high.
2. Spacing between buttons should be no less than 1/16".
3. Where buttons are immediately adjacent, the active selection area of the button should be reduced to 80% of the visual area of the button.

H. Button Actions

1. When a function on a control page is selected, that button or visual object associated with that function should change to reflect what has been chosen.
2. For functions that are momentary selections (i.e., VOL UP), the change of state is visible for as long as the button is being pressed.
3. For function that are maintained selections (i.e., PLAY), the change of state remains visible until another function is selected and resets the previous function.
4. The state change of a button or visible object should depict real-world objects as much as possible including the appearance of the button be pressed inward, change in shade of the original color, but not a change in hue.

I. Labels

1. Use of simple words or titles are preferred to indicate functionality, navigation and system status.
2. Use of stylish symbols should be avoided unless their identity is commonly recognized by the general public. Standard symbols for transport functions are acceptable.
3. Labels should be presented in a clear, sans serif type face that will remain legible on lower resolution touch panels.
4. Where physical buttons are present along the side of a touch panel, these buttons should be engraved and filled with a contrasting color.

J. Power On/Off

1. For panels requiring an ON/OFF control, these functions should be linked through current sensors or other methods for the control system to detect the power on condition of the component being controlled.
2. Powering off a system should not interfere with the ability of a projector to complete its cool down cycle.

K. Look & Feel

1. Control pages should utilize a clean, elegant but stylish appearance.
2. Use a common graphical template across all control pages for a consistent look.
3. The touch screen layout should utilize graphical elements such as drop shadows, gradient fills and transparency to provide a pleasing overall appearance.
4. Utilize graphical representations of floor plans to convey location information.
5. Include company logos, icons or watermarks to portray the corporate identity.
6. Provide clear navigation tools for moving between control pages.
7. Each sub-page should have a "BACK" button to return to the previous page. This button should appear in the same location on each page.
8. Provide a "HELP" button or icon on each user page to provide clear, non-technical instructions on how to use the functions available to regular users.

L. Security

1. Provide password access to control pages not intended to be accessed by the general public.
2. Unless otherwise noted, provide a minimum of three levels of access
 - a. General User
 - b. Non-Technical Employee
 - c. AV Technician
3. Segregate the control functions to only allow authorized individuals access to more sophisticated control pages.

4. Provide a timeout feature to automatically return the control panel back to the default opening screen after 30 seconds of inactivity. After this reset, passwords must be reentered to return to a previous control page.

M. Presets

1. For systems that have different operating modes or configurations, provide the ability to store and recall preset combinations of system settings.
2. Provide a "Preset" page that permits a minimum of five presets to be recalled. Each button to include a label describing the function or configuration associated with that button.
3. Provide the ability for new presets to be stored over previous settings. New preset to be able to change the label to reflect the new or revised configuration.
4. When a preset has been recalled, the control page should indicate the active configuration.

3.5 LABELING OF EQUIPMENT

- A. Provide each terminal strip with a unique descriptor and a numerical designator for each terminal. Show terminal strip descriptor and designator on system schematic drawing.
- B. Provide logical and legible cable and wiring label permanently affixed for easy identification.
 1. Labels on cables to be adhesive strip type covered with clear heat-shrink tubing. Factory stamped heat shrink tubing may be used in lieu of the adhesive strip style.
 2. Wiring designator to be an alpha-numeric code unique for each cable. Actual cable designation assignments to be determined by Contractor. Add cable designation codes to system schematic drawings.
 3. Locate the cable designator at the origination and destination of each circuit within 3 inches of the point of termination or connection. Provide cable designator on circuits with intermediate splice points with an additional suffix to indicate each segment.

3.6 ENGRAVING

- A. Text font: 1/8 inch block sans serif characters unless noted otherwise.
- B. On dark materials, provide white characters; on stainless steel or brushed natural aluminum plates, or light-colored materials, provide black characters.
- C. Provide at least two lines of text with first line listing the general device name, e.g., amplifier. Second line to include schematic reference of the device, e.g., AMP-1.
- D. Equipment label: black with white characters except where indicated.

3.7 COMMISSIONING

- A. Prior to energizing or testing the system, ensure the following:
 1. All products are installed in proper and safe manner according to manufacturer's instructions.
 2. Insulation and shrink tubing are present where required.
 3. Dust, debris, solder splatter, etc. is removed.
 4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.

5. Labeling has been provided.
 6. Temporary facilities and utilities have been properly disconnected, removed and disposed of off-site.
 7. Products are neat, clean and unmarred and parts securely attached.
 8. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired, and debris cleaned up and discarded.
- B. Prior to energizing the System verify and perform the following tests and adjustments in compliance with applicable EIA standards.
1. Electronic devices are properly grounded.
 2. Test each AC power receptacle with a circuit checker for proper hot, neutral and ground connections.
 3. Verify each individual component is operating properly.
 4. Verify each individual component's performance meets the manufacturer's published performance for this unit.
 5. Measure and record the DC resistance between the technical ground in any equipment rack or console and the main building ground. Resistance should be 0.15 ohms or less.
- C. Speaker Circuit Verification Test
1. Measure the impedance of each speaker line leaving the equipment racks.
 2. For constant voltage systems measure the impedance at 100 (or 250) Hz, 1 KHz and 8 (or 10) KHz of each line leaving the equipment rack with the line disconnected from the driving source. For band limited devices, use a frequency appropriate for the operating range of the transducer.
 3. When documenting the results of these tests, include the calculated impedance based on number of units on a line and the size and distance of the run. Correct any field readings that differ more than 20% from the calculated impedance.
 4. Include the results of the tests in the Project Record Manual.
- D. Speaker Polarity Verification Test
1. Use an electronic polarity checker, TEF-20, SYSID, SIM II, Smaart, or other similar device to test each loudspeaker. All speakers should have the same relative polarity.
 2. Follow manufacturer's recommendations in conducting the tests.
 3. Include the results of the tests in the Project Record Manual.
- E. Audio Signal Paths
1. Verify operation from each source device through all switching, amplification and distribution devices.
- F. System Gain Adjustment
1. Adjust each active device to have proper gain structure from the mixer output to the input of the amplifier.
 2. With all amplifiers turned off, connect a sine wave or pink noise generator to the input of the mixer. Using an RMS AC voltmeter with a dB scale, adjust the mixer to an output between -10 and 0 dBu. Once the level has been established, it should remain unchanged throughout the test. All equalizers should be set flat for this test.
 3. Follow the signal flow from the mixer to each subsequent component. Measure the input level and output level of each device at the point of connection to the device.

The input level reading should differ no more than 0.25 dB from the level recorded for the preceding device. Diagnose and correct the wiring or equipment when any readings exceed this range.

4. Adjust the output of each component to achieve the proper output level.
5. Record the output levels of each device in the Project Record Manual.

G. Signal Delay Adjustment

1. Adjust the delay to each subsystem to ensure proper synchronization between the main speakers and delayed speakers.
2. Using a TEF 20, SYSID, Smaart, SIM II, or other acceptable time based measurement system, measure the arrival time of the distant signal and then measure the arrival of the local signal.
3. Based on the arrival times measured, adjust the delay applied to the local speakers to synchronize them with the distant speakers. Repeat the test to verify the delay has been set to within 1 ms of the arrival of the distant signal. Once the precise delay time has been determined, provide an additional 10 ms of Haas effect delay to maintain directional orientation toward the original sound source.
4. Continue to test and adjust each separate subsystem with a dedicated delay channel.
5. Provide hard-copy printout of each delay adjustment showing first the arrival times with no delay set and then the result after the delay has been adjusted. Record the settings of each delay in the Project Record Manual.

H. Remote Input Verification Test

1. Using a microphone or portable signal generator, connect to each microphone/line level receptacle throughout the facility.
2. Verify that the receptacle under test appears at the correct input and is operating properly.
3. In a similar manner, check all remote tielines and media related lines for correct wiring and labeling.

I. System Equalization

1. Using a RTA, TEF 20, SYSID, or SMAART, equalize all loudspeaker systems to provide a suitable frequency response as follows:
 - a. Speech Reinforcement Systems: flat response from 125 Hz to 2.5 KHz, with 2 dB roll off above.
 - b. Program Reproduction Systems: flat response from 65 Hz to 8 KHz, with 2 dB roll off above.
2. Verify system gain and amplifier levels.
3. Provide program levels of at least 85 dB and speech reinforcement levels of at least 70 dB in the seating area without objectionable distortion, buzzes, or rattles.
4. Provide hard copy printouts of the spectral response with the test data.

J. RFI and Parasitic Oscillation

1. With systems operating check to ensure that all systems are free from spurious oscillation and radio frequency interference in the absence of audio signal.

K. Buzzes, Rattles and other Distortions

1. Adjust the system for normal operating level in the space. Apply a slow sine wave sweep from 60 Hz to 3 KHz and listen carefully for buzzes, rattles and other objectionable distortions.

2. Correct the cause of the defect. If the cause is not from the system. Bring the cause to the attention of the GC, indicating cause and suggestive corrective actions.
- L. Video Systems Test
1. Projected images and screen must be plumb with respect to ceiling line.
- M. Video System Tests. Verify performance of all video equipment, components and systems, as specified herein.
1. Video (signal):
 - a. S/N (peak to RMS), unweighted DC to 4.2 MHz: 55 dB minimum.
 - b. Crosstalk, unweighted DC to 4.2 MHz: 45 dB minimum.
 - c. Frequency Response: Within plus to minus 0.5 dB to 4.2 MHz.
 - d. Line and Field Tilt: 2% maximum.
 - e. Differential Gain: 2% maximum.
 - f. Differential Phase: 2 degrees maximum.
 - g. Frequency Response: DC to 4.2 MHz within plus or minus 0.5 dB.
- N. Video Signal Paths
1. Verify operation from each source device through all switching, amplification and distribution devices.
- O. Video Test Report shall include the following:
1. Test Failures and Notices
 - a. Sink Device EDID Test – Open items or failures shall not be accepted.
 - b. Cable Length Test – Open items or failures shall not be accepted.
 - c. HDCP KSV Limitations – Limitations shall not be accepted.
 - d. Cable Limitations - Limitations shall not be accepted.
 - e. EDID Limitations - Limitations shall not be accepted.
 - f. Cable Length Limits exceeded – Failing cables shall not be accepted.
 2. Device Model Number, Serial Number, and Firmware Version for main chassis and each input and output card.
 3. Device Model Number, Serial Number, and Firmware Version for connected transmitter and receiver devices.
 4. EDID – Input Resolution and 3D support status for each input.
 5. EDID – Supported Output Resolution and 3D support status for devices connected to each output.
 6. EDID – Supported Audio formats for each input.
 7. EDID – Supported Audio formats for devices connected to each output.
- P. Control Systems
1. Verify operational functions of the control system and all interfaced devices.
 2. Verify operational functionality of any wireless user devices.
- 3.8 CAT5E/CAT6 CABLE CERTIFICATION
- A. General Field Test Requirements
1. All CAT5E/CAT6 cabling links installed as part of this scope shall be tested for the following, in accordance with the field test specifications defines in ANSI/TIA-568-C.2 "Commercial Balanced Twisted-Pair Telecommunications Cabling and

Components Standard.” This document will be referred to as the “Category 5e Standard”:

- a. Wire Map
 - b. Length
 - c. Insertion Loss
 - d. NEXT loss
 - e. PS NEXT Loss
 - f. ACR-F Loss
 - g. PS ACR-F Loss
 - h. Return Loss
 - i. Propagation Loss
 - j. Delay Skew
2. The installed twisted-pair horizontal links shall be tested from terminated end point to terminated end point for compliance with the “Permanent Link” performance specification as defined in the Category 5e Standard.
 3. One hundred percent of the installed cabling links must pass the requirements of the Category 5e standard mentioned above and as further detailed in Section B below. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section C below.
 4. The test equipment (tester) shall comply with the accuracy requirements for level IIe field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 2 of ANSI/TIA-1152 (Table 2 in this TIA document also specifies the accuracy requirements for the channel configuration).
 5. The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
 6. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
 7. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
 8. The Pass or Fail condition of the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass.
 9. A Pass or Fail result for each parameter is determined by comparing the measured values with the specifies test limits for that parameter.

B. Performance Test Parameters

1. The test parameters are defined by the Category 5e Standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz through 100 MHz) must meet or exceed the limit value determined in the above mentioned standard.
2. Wire Map - Shall report Pass if the wiring of each wire-pair from end to end is determined to be correct.
3. Length – The field tester shall be capable of measuring length of all pairs of a basic link or channel based on the propagation delay measurement and the average

value for NVP. The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the Permanent Link configuration (90 meters – 295 feet) plus 10% to allow for the variation and uncertainty of NVP.

4. Insertion Loss (Attenuation) – Insertion Loss is a measure of signal loss in the permanent link or channel. The term “Attenuation” has been used to designate “Insertion Loss.” Insertion Loss shall be tested from 1 MHz through 100 MHz in maximum step size of 1 MHz. It is preferred to measure insertion loss at the same frequency intervals as NEXT loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk Ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results of the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which the worst case value occurs, and the test limit value at this frequency.
5. NEXT Loss – Pair-to-pair near end crosstalk loss (abbreviated as NEXT loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations). This parameter is to be measured from 1 through 100 MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT loss measurements shall not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

Frequency Range (MHz)	Maximum Step size (MHz)
1 - 31.25	0.15
31.26 - 100	0.25

6. PS NEXT Loss – Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link under-test (a total of eight results). PS NEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 100 MHz and the step size may not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Maximum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS next. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
7. ACR-F Loss, pair to pair – Attenuation Crosstalk Ratio Far-end is calculated from the pair-to-pair FEXT Loss. It shall be measured for each wire-pair combination from both ends of the link under-test. FEXT Loss measures the crosstalk disturbance on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to compute ACR-F Loss that must be evaluated and reported in the test results. ACR-F measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire pair combinations. ACR-F is to be measured 1 through 100 MHz and the maximum step size for FEXT loss measurements shall not exceed the maximum step size defined as the standard as in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value for ACR-F. There wire pairs must be identified for the tests performed from each

- end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
8. PS ACR-F Loss – Power Sum Attenuation Crosstalk Ratio Far-end is a calculated parameter that combines the effect of the FEXT disturbance from three wire pairs of the fourth one. This test yields eight wire-pair combinations. Each wire-pair is evaluated from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
 9. Return Loss – Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst value of Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
 10. Propagation Delay – Propagation delay is the time required for the signal to travel from one of the links to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst propagation delay. The report shall include the propagation delay value measured as well as the test limit value.
 11. Delay Skew – [as defined in the Category 5e Standard; Section 6.2.19] This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

C. Test Result Documentation

1. The test results/measurements shall be transferred into a Windows based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test and that these results cannot be modified at a later time.
2. The database for the completed job shall be stored and delivered on CD-ROM or DVD including the software tools required to view, inspect, and print any selection of test reports.
3. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
 - a. The identification of the link in accordance with the naming convention defined in the overall system documentation.
 - b. The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number.
 - c. The date and time the test results were saved in the memory of the tester.
4. General information to be provided in the electronic data base with the test results information for each link:
 - a. The identification of the customer site as specified by the end-user.
 - b. The identification of the link in accordance with the naming convention defined in the overall system documentation.
 - c. The overall Pass/Fail evaluation of the link-under-test

- d. The name of the test limit selected to execute the stored test results
 - e. The cable type and value of NVP used for length calculations
 - f. The date and time the test results were saved in the memory of the tester
 - g. The brand name, model, and serial number of the tester.
 - h. The identification of the tester interface
 - i. The revision of the tester software and the revision of the test limits database in the tester
 - j. The test results information must contain information on each of the required test parameters that are listed in Section B and as further detailed below under paragraph C5.
5. For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.
6. The detailed test results data to be provided in the electronic database must contain the following information:
- a. Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m330 and test limit value.
 - b. Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value.
 - c. Delay Skew: Identify the pair with the largest value for delay skew, the value measured in nanoseconds (ns) and the test limit value.
 - d. Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair.
 - e. Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link.
 - f. NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.
 - g. PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.

3.9 FINAL OBSERVATION & TESTING

- A. Upon completion of installation, initial adjustments, tests and measurements specified in Part 3, and submission and review of the results, a final observation and test will be performed by the Owner or Owner's representative no earlier than two weeks after receipt of the written results.
- B. Provide a minimum of one (1) person for observation and testing familiar with aspects of the System to assist the Owner.
- C. The process of testing the System may necessitate moving and adjusting certain components.
- D. Testing includes operation of each major system and any other components deemed necessary. Perform tests and provide required test equipment, tools and material required to make any necessary repairs, corrections, or adjustments.
- E. The following procedures will be performed on each System:
 - 1. Observation of the methods and means employed to incorporate the System within the facility.

2. Verification of proper operation, from controlling devices to controlled devices.
 3. Verification of proper adjustment, balance, and alignment of equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each level control, and appropriately record these settings within the Record Documents.
 4. Other tests on equipment or systems deemed appropriate.
- F. In the event the need for further adjustment or work becomes evident during testing, the Contractor is to continue his work until the System is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications and any extension of the observation and testing period is required, the Contractor shall pay for additional time and expenses of the Owner at the standard rate in effect at that time.

3.10 TEST EQUIPMENT

- A. Thirty days prior to start of testing, provide a list to the Owner of test equipment make, model numbers and calibration dates that will be used.
- B. The following equipment shall be available on site for the entire test period through final system testing.
1. Sound Level Meter : ANSI S1.4-1971 Type S1A with digital or analog display. Meter to provide ranges of 40 to 120 dBA.
 2. Pink Noise Source - Equal energy per octave bandwidth 20 Hz to 20,000 Hz, ± 1 dB (long-term average) at 0 dBm output. Stability: ± 2 dB per day.
 3. Dual-trace oscilloscope - 100 MHz bandwidth, 1 mV/cm sensitivity.
 4. Impedance Meter - Capable of testing audio lines at three frequencies, minimum, between 250 Hz and 5k Hz. Measurement Range: 1 ohm to 100 kohms.
 5. Audio Oscillator: bandwidth 20 Hz to 20k Hz ± 5 dB at 0 dBm output. Output to be balanced. Oscillator to include adjustable output level over the range from -30 dBu to $+10$ dBu.
 6. Multimeter - Measurement range, DC to 20k Hz, 100 mV to 300 V, 10 ma to 10 A, dB.
 7. NTSC Test generator
 8. Real time analyzer with LED or CRT display. The unit shall meet the filter requirements of ANSI S1.11 Class III for one third octave filters.
 9. Video (analog) test generator capable of generating signal up to 1920 x 1200 with audio.
 10. Video (digital) test generator capable of generating signal up to 1920 x 1200 with audio.
 11. Ladders and scaffolding necessary to inspect elevated equipment, junction boxes, etc.
- C. Provide three portable VHF or UHF business band radios for use during acceptance testing with transmission range sufficient to cover entire project. Include rechargeable batteries and recharger along with holster for wearing on belt. Radios to be available for duration of testing process, including any follow-up visits required prior to final acceptance.

3.11 INSTRUCTION OF OWNER PERSONNEL

- A. Provide instruction to Owner designated personnel focusing on the use, operation and maintenance of the systems, scheduled as a minimum of two separate sessions, by an instructor fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of demonstration with Owner's Representative.

1. Area
 - a. 8 hours of instruction
 - B. Video record all training sessions and compile a training video to be provided to the Owner on DVD.
 - C. Provide sign in sheet to document the attendee's presence.
 - D. If Contractor is not properly equipped to conduct Owner training on particular equipment, arrange for factory representatives of the equipment to be present to provide training at no additional cost to the Owner.
- 3.12 CLEANUP AND REPAIR
- A. Upon completion of the work, remove refuse and rubbish from and about the premises. Leave areas and equipment clean and in an operational state. Repair any damage caused to the premises by the installation of systems at no cost to the Owner.

END OF SECTION 27 41 16

SECTION 28 05 13 - TELEPHONE/DATA/CATV COMMUNICATION SYSTEM(S)

PART 1 - GENERAL

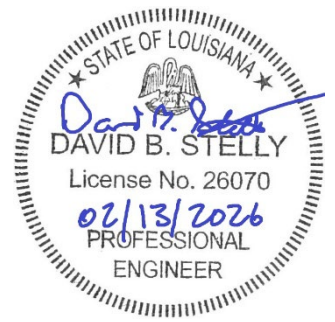
- 1.1 The Contractor shall provide, install and connect the complete telephone/data system equipment, backboards, conduit, cable tray, j-hooks, wiring and testing as specified herein and shown on the drawings.

1.2 SCOPE OF WORK

- A. This installation includes the furnishing of labor, materials, and equipment required for the installation of all service, inside station, and riser cables for telephone and data use between distribution frames, and to each station outlet location required by the plans and specifications.
- B. The work shall include but is not necessarily limited to the following:
1. Furnish and install telephone outlets, data outlets, TV outlets, cables, connecting blocks, backboards, conduits, mounting brackets and associated hardware for bundling, racking and cross-connecting as required.
 2. Furnish and install one (1) 1" C from each tele/data outlet concealed up wall to above ceiling. Turn conduits 90° and extend conduit to accessible ceiling space. Provide nylon bushings at ends of conduits.
 3. Furnish and install two (2) 4-pair EIA - Category 6 UTP telephone/data station cable to each tele/data outlet shown on the drawing and specified herein. Coil 36" of spare cable (for each cable installed) and secure loop at quarter points of the loop. Extend cables to respective termination point(s). Cables shall be plenum rated where installed in plenums.
 4. Furnish and install duplex EIA/TIA 568A, 8 pin 4-pair modular RJ45 data jacks at each telephone/data outlet shown on drawings as specified herein. Color of each jack shall comply with owner's color-coding requirements. Verify color coding requirements in writing with owner prior to purchasing jacks.
 5. Furnish and install 6-position modular type wall outlets for all telephone/data shown on the plans. Color of wall outlets shall match color of wall devices and shall be selected in shop drawings.
 6. Furnish and install grounding and ground bars as shown on the drawings and as specified. Refer to specification section "Grounding" and to details for additional requirements.
 7. Provide and install all required pigtails to Type 110 blocks and terminate each end of the multi-pair station service cables. Copper phone cables only.
 8. Furnish and install on the plywood wall backboards all type 89 brackets and Type 110 terminal blocks as shown on the drawings and specified herein for proper termination of the wiring. Copper phone cables only.
 9. Furnish and install type 184 binder post as required on backboards. Copper phone cables only.

1.3 APPLICABLE DOCUMENTS

- A. The following current issues of rules and regulations shall apply to this scope of work:
1. EIA/TIA 568, 569, 570, 606, TSB36, TSB40
 2. Building Industry Consulting Service (BICS)
 3. Telephone Standards Handbook GHB-155
 4. Planning Handbook CHB-156
 5. Design Handbook CHB-157
 6. REA Construction and Installation Manuals



7. REA Specification PC4 for Acceptance Tests
8. List of Materials Acceptable for use on telephone systems of REA borrowers
9. National Electric Code (NEC)
10. State and Local Codes
11. Telco System Practices
12. UL

1.4 GENERAL REQUIREMENTS

- A. Installation costs including all necessary materials, cables, closures, bridging clips, splice materials, and terminations are to be the responsibility of the Contractor.
- B. Cables routed above the drop ceiling and where not installed in conduit shall be supported to the structure utilizing "J" hooks. Cables are not allowed to rest on the ceiling tiles nor building steel. Maximum clearance to other electrical systems shall be maintained.
- C. All cables, wires, and equipment shall be securely and neatly installed. Inside routings shall be installed parallel and perpendicular to existing structural lines and members.
- D. All cables, wires, and equipment shall be firmly held in place. Fastening and support shall be adequate to support their load with ample safety factors.
- E. The Contractor shall be responsible for replacing, restoring, or bringing to original condition any damage to floor, ceilings, walls, furniture, grounds, pavement, etc., caused by his personnel and operations. Contractor shall restore any damage or disfigurements at his expense.
- F. Cables shall be continuous; no splices will be allowed.
- G. The Contractor shall refer to the Construction Phasing Description section of these specifications for additional information and requirements. It is intended that the Telephone and Data Communications System be placed in service and be of beneficial use to the Owner at the completion of each construction phase of the work prior to occupancy by the Owner.
- H. The Contractor shall coordinate all this work with the Owner's Information Network Department to maintain tele/data service to the old and new systems as may be required. The Contractor will provide all new services as specified and shown on the drawings in a timely manner.
- I. The Contractor shall not interrupt existing tele/data services and systems in any way until new facilities are in place and approval is received from the Information Network Department and the Architect/Engineer.

1.5 SUBMITTALS

- A. Submit to the engineer shop drawings, product data (including cut sheets and catalog information). Submit shop drawings, product data with such promptness and in such sequence as to cause no delay in the work or in the activities of separate contractors. The engineer will indicate approval of shop drawings and product data submitted to the engineer by stamping such submittals "APPROVED" with a stamp. Submitted shop drawings shall be initialed or signed by the contractor, showing the date and the contractor's legitimate firm name.
- B. By submitting shop drawings and product data, the contractor represents that he or she has carefully reviewed and verified materials, quantities, field measurements, and field

construction criteria related thereto. It also represents that the contractor has checked, coordinated, and verified that information contained within shop drawings and product data conform to the requirements of the work and of the contract documents.

- C. The engineer remains responsible for the design concept expressed in the contract documents as defined herein.
- D. The engineer's approval of shop drawings and product data submitted by the contractor shall not relieve the contractor of responsibility for deviations from requirements of the contract documents, unless the contractor has specifically informed the engineer in writing of such deviation at time of submittal, and the engineer has given written approval of the specific deviation. The contractor shall continue to be responsible for deviations from requirements of the contract documents not specifically noted by the contractor in writing, and specifically approved by the engineer in writing.
- E. The engineer's approval of shop drawings and product data shall not relieve the contractor of responsibility for errors or omissions in such shop drawings and product data.
- F. The engineer's review and approval, or other appropriate action upon shop drawings and product data, is for the limited purpose of checking for conformance with information given and design concept expressed in the contract documents. The engineer's review of such submittals is not conducted for the purpose of determining accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the contractor as required by the contract documents. The review shall not constitute approval of safety precautions or of construction means, methods, techniques, sequences, or procedures. The engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.
- G. Perform no portion of the work until the engineer has approved the respective submittal. Such work shall be in accordance with approved submittals.
- H. Submit shop drawings and product data as a complete set within thirty (30) days of award of contract.
- I. For initial submission and for re-submission required for approval, submit one (1) electronic copy of each item. Make reproductions as required for your use and distribution to subcontractors. Reproduction of documents will be at contractor's expense. Illegible submittals will not be checked by the engineer.
- J. General: Submit the following:
 - 1. Bill of materials, noting long lead time items
 - 2. Project schedule including all major work components that materially affect any other work on the project
- K. Shop drawings: Submit the following:
 - 1. Backbone (riser) diagrams.
 - 2. System block diagram, indicating interconnection between system components and subsystems.
- L. Product Data -- Provide catalog cut sheets and information for the following:
 - 1. Wire/Cable.
 - 2. Outlets, jacks, faceplates, and connectors.

3. Terminal blocks and patch panels.
4. Enclosures, racks, and equipment housings.
5. Over-voltage protectors.
6. Splice housings.

1.6 QUALITY ASSURANCE

- A. Commscope cabling systems, Hubbell Premise Wiring Cat 6 Cabling, and Com Tran Cable - Signamax connectivity are approved for the work of this section.
- B. The contractor shall be an authorized Manufacturer's cabling system contractor.
- C. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size and be currently operating service organization within 50 miles of project site.
- D. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.
- E. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes toward the owner and engineer/designer.

1.7 WARRANTY

- A. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and workmanship, of all cabling system components, for a period of not less than twenty-five (25) years from date of acceptance by the owner.
- B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Final payment shall not relieve contractor of these obligations.
- C. Installation costs including all necessary materials, cables, closures, bridging clips, splice materials, and terminations are to be the responsibility of the Contractor.
- D. Installer Qualifications :
 1. The Data Cable System Installer shall be licensed and shall meet all applicable regulations of the local and state authorities insofar as they apply to this type of system. The proposer shall be a firm normally employed in the low voltage and data cabling industry and shall provide a reference list of ten (10) large-scale projects and contact names confirming successful Category 6 premises wiring system installations.
 2. The Installer shall be a local area, integrator of the manufacturer's product and must provide the manufacturer's maximum available warranty on the entire system. The contractor's certification must have been obtained and held within 75 miles of the project's location.
 3. The installing contractor must have a full-time employed RCDD (Registered Communications Distribution Designer) on staff. Current RCDD certification shall be provided in the product submittals.
 4. All individuals must be employees of the certified installer and at least 25% of the installing staff shall have undergone a training class given by the manufacturer. Current certification indicating the successful completion of the training course shall be available upon request at the project and submitted in the contractor's product submittals.

PART 2 - PRODUCTS

2.1 MATERIAL SPECIFICATIONS

A. Inside Unshielded Twisted Pair (UTP)

1. All unshielded twisted pair requirements for use shall meet EIA Category 6 specifications (plenum rated when installed in plenum spaces).
 - a. NEC
 - b. UL
 - c. ANSI/ICEA Publication S-80-576
 - d. EIA/TIA 568, 569, 570, 606, TSB 36, TSB 40
2. Multi-pair Riser Cables
 - a. Cables from the MDF shall be further distributed to each of the other closets and terminated on 110 block in the IDF's there. The intra-building inter-IDF cables shall be of the multi-pair type, conforming to or exceeding the following EMMA 568 physical specifications of CAT 6 physical specification.
3. UTP Patch Cords
 - a. EIA Category 6 UTP patch cords (8' in length) shall be supplied at each wall outlet for each jack installed. At the MDF's and IDF's, patch cords shall be terminated at both ends in 4-pair Type 110 or equivalent connectors for plugging onto the type 110 or equivalent cross-connect panels, IDF's and MDF's. The other patch cords shall be terminated in 8 position modular male connectors at both ends conforming to FCC Part 68 Rules, Subpart F. The ends shall be wired in accordance with EIA/TIA 568B.
4. UTP Termination Wall Plates
 - a. The four-pair horizontal cables shall be terminated on 6-position modular duplex (two) outlets meeting EIA specifications for EIA Category 6 UTP and configured in compliance with T56B. The outlets shall be in compliance with FCC Part 68 Rules, Subpart F. The outlets with integrated or separate cover plates shall be installed in single standard electrical wall boxes. The data termination shall allow keyed connectors. The termination of wires shall be by the insulation displacement method equivalent to type 110 and shall require the use of the same punch down tool as the UTP termination blocks specified below.
 - b. Jacks shall allow the insertion of 4 and 6 pin plugs as well as 8 pin plugs or RG6 - Coax connectors. Metal faceplates specified for all wiring devices. Each faceplate shall have provisions for inserting colored tabs to provide use identification for each jack
5. UTP TERMINATION BLOCKS
 - a. At the MDF and IDF closets, all UTP cables shall be terminated on rack mounted two (2) "U" 48 -port patch panels and terminating blocks meeting EIA/TIA 568 specifications for EIA Category 6 UTP. These terminating blocks shall be used for MDF's, IDF's and all UTP cross-connect requirements. They shall allow termination of cables as well as the capability of connecting pre-assembled single pair and composite 4-pair patch cords. Termination blocks to be used for terminating outside plant cables shall be equipped with gas discharge protection units.
 - b. The blocks shall be equipped with designation strips and color coded for terminating sets of four pairs of wires in accordance with ICEA specifications.
 - c. Cable tie wraps shall be included to neatly route, store and organize the termination cables.
6. UTP CABLES AND PATCH CORDS COLOR CODING

- a. Wireless access points - white.
 - b. All other ethernet - blue.
- 7. TELEPHONE SYSTEM
 - a. Contractor shall provide and install two (2) CAT 3 UTP cables from the AT&T service point in the MDF to each elevator machine rooms. Terminate on wall plates in machine rooms as specified.

PART 3 - EXECUTION

3.1 PAIR IDENTIFICATION

- A. The following room recording procedure shall be completed after each wire or cable has been pulled:
 - 1. Terminations: Telephone station cables, CATV station cables and data station cables shall be tagged at backboards with cable tags indicating telephone or data and marked with room number to which it is connected. In rooms where more than one jack exists, the jacks are to be numbered sequentially and indicated on the cable tag. The outlet number shall also be indicated on the faceplate of the jack.
 - a. Each pair terminated shall be legibly labeled on the terminal blocks according to the room number and jack with which it is associated.
 - b. Each station wire shall be plainly marked at its backboard end with the room number to which it is connected and terminated on the Type 110 termination blocks.
 - c. All cables will be legibly and permanently numbered at each end. String tags are not acceptable.

3.2 CROSS CONNECTIONS

- A. At the backboards, Contractor shall cross connect all pairs from each station cable designated for telephone and/or data use to an incoming pair of the riser cable designated for telephone and/or data use. The cross connection of these pairs should provide four (4) continuous pair from each data outlet and one (1) continuous blue/white pair from each telephone located on that floor. Contractor shall label each pair on the Type 110 terminal according to the numbering scheme.

3.3 UTP NETWORK

- A. The UTP network consist of the following elements:
 - 1. MDFs
 - 2. Wall Plates
 - 3. Patch Cables

3.4 CABLE INSTALLATION

- A. The contractor shall optimize cable utilization by designing splice points. All cable splices and cable routed through manholes shall be supported on cable racks.

3.5 INSIDE

- A. The cables in the risers and closets shall be neatly bundled and tie wrapped. Cable trays shall be provided and installed where necessary, especially between the backboards and equipment racks, and the backboard and the horizontal pathways. Cables traversing the vertical paths shall be anchored to the wall. The method and means of running horizontal cable distribution will vary. Each duplex wall outlet shall have a conduit that runs in the

wall from that outlet to the wire closet. Thus, the 4-pair horizontal cable runs shall emanate at the wall outlets, run along the wall conduit, and terminate at the voice or data patch panel in the wire closet.

- B. All cables shall be labeled and color coded in accordance with the EIA 606 standard.

3.6 HORIZONTAL RUNS

- A. The wall outlets are of three types: voice, data, and CATV. The voice outlets shall be connected to the voice cross-connect panels in the wire closets. The data outlets are identified by the keyed slot, and they shall be connected to the data cross-connect panels in the wire closets. The voice and data cross-connect panels are identified on the closet drawings. The wall outlets shall be wired in accordance with EIA T568B configuration. At each wall outlet, 18 inches of wire shall be allowed spare for future changes.
- B. Since the cables to be terminated shall be of EIA Category 6 quality, all terminations shall ensure minimum of untwisting at the connections. The length of wire shall be untwisted only to the extent necessary for making the connection. Both the cross-connect panels and the wall outlets are of type 110. These allow the twists to be maintained to the point of termination. Also, the cable slots between the index strips provide space to maintain cable shield to the point of termination.
- C. All terminations on the cross-connect panels shall be labeled and color coded in accordance with industry standards as specified by EIA. All terminations, cables and panels shall be identified and labeled in accordance with EIA 606.

3.7 RISER CABLES

- A. The individual cable wires shall be installed in accordance with the method and color coding described under Installation and Test Instructions.
- B. The terminations on the central IDF shall be identified to indicate the MDF connections and the floor connections, both with their own sequential numbering scheme that corresponds with the other end of the cable and also indicated at the location of the other end of the cable. The terminations on the individual floor IDFs shall identify the position on the MDF.

3.8 TESTING

- A. All conductors in every cable shall be tested end-to-end to prove that they meet the cable specifications described in EIA standards and this document. The tests shall be conducted in the presence of a Telecommunications Specialist. All tests shall be completed first before any corrective action is taken. Corrected conductors shall be tested again. The Telecommunications Specialist reserves the right to request that the conductors passing the previous tests be tested again after corrective action has been taken on the faulty conductors. Conductors not passing the tests shall also be documented together with the corrective action taken. Test results shall be documented and supplied before the installation is considered for acceptance.
- B. The following tests shall be conducted as a minimum:
 - 1. Compliance with color coding
 - 2. Tip and ring polarity
 - 3. Neatness of cable routing and tie downs
 - 4. Continuity
 - 5. Shorts, grounds and opens
 - 6. Crosses (shorts to other pairs)

- 7. Rolls (reversed polarity)
- 8. Splits

3.9 ACCEPTANCE TESTING

- A. When the Contractor has completed all cable installation and termination, and he is ready for testing, he shall inform the Architect/Engineer of the intent. The Architect/Engineer shall assign the Telecommunications Specialist who shall monitor the Contractor testing. The Architect/Engineer has the authority to accept or reject any test and request, and, at his discretion, complete retesting of any portion of the plant if there are an unreasonable number of pairs not passing tests indicated above. The Architect/Engineer may request the Contractor to replace any portion of the plant if the tests indicate faulty or improper installation, or numerous repairs are necessary to pass the tests. The plant shall be accepted by the Architect/Engineer after the Contractor has demonstrated that all the pairs have passed all the tests, all the tests have been documented, the plant is labeled and recorded, and all plant records have been provided in accordance with the requirements of the Documentation Sub-Section later in this document. The Contractor shall comply with any and all warranties required by the general contract agreement with the Architect/Engineer.

3.10 GROUNDING

- A. The buildings shall be equipped with central point grounding schemes. A master ground bar shall be installed at the MDF. Ground window bars shall be installed at the IDF in every other closet. All cables with metallic elements and all metallic hardware shall be grounded in accordance with REA Section 810 and EIAMA PN-2327 grounding specifications for telecommunications.

3.11 DOCUMENTATION

- A. The Contractor shall provide two sets of documents. One set shall provide a record of all the tests conducted on cables, terminations, etc. Another set shall depict all the telecommunications wiring and cabling installation, within and to the building.

3.12 TEST DOCUMENTATION

- A. Test records shall be provided for the following tests:
 - 1. UTP, Terminations
 - a. Manufacturing test results
 - b. Outside plant cables
 - c. Riser cables
 - d. Horizontal cables

3.13 RECORD DOCUMENTATION

- A. After all installations have been completed and tested, the Contractor shall provide records of the installation in accordance with EIA/TIA Standard 606. The records shall be required in hard copy format printed from a software such as Cable Management Systems by Microtest (CMS). CMS is a commercially available off-the-shelf software designed specifically for cable installation records. The Contractor shall supply the software and the records using the software to one FWS technician.
- B. As described in the EIA standard, the following types of records shall be supplied:

1. Voice and data terminations located in work areas, telecommunications closets, equipment rooms and entrance facilities.
2. Telecommunications media between terminals (horizontal distribution).
3. Pathways between terminations that contain the media.
4. Spaces where terminations are located.
5. Bonding/grounding as it applies to telecommunications.

C. All the elements of the telecommunications infrastructure shall be identified and labeled by a code. The coding method to be used shall be as specified in the EIA 66 standard. On the following page is a representative list reproduced from the standard (xxx denotes a numerical designation).

CODE	DESCRIPTION
BCxxx	Bonding Conductor
BCDxxx	Backbone Conduit
Cxxx	Cable
CBxxx	Backbone Cable
CDxxx	Conduit
CTxxx	Cable Tray
ECxxx	Equipment (bonding) conductor
EFxxx	Entrance Facility
ERxxx	Equipment Room
Fxxx	Fiber
HHxxx	Hand Hole
ICxxx	Intermediate Cross-Connect (IDF)
Jxxx	Jack (Outlet)
MCxxx	Main-Cross-connect (MDF)
MHxx	Man hole or maintenance hole
PHxxx	Pull Box
Sxxx	Splice
SExxx	Service Entrance
SLxxx	Sleeve
TCxxx	Telecommunications Closet
TGBxxx	Telecommunications grounding busbar
TMGB	Telecommunications main grounding busbar
WAxxx	Work Area

3.14 MAINTENANCE CONSIDERATIONS

- A. The cable installation shall be installed to maximize the safety, maintainability, and performance effectiveness of maintenance personnel, and shall minimize demands upon skills, training and manpower. Splices/terminations shall be placed and supported so as to maximize the efficiency and ease with which it can be maintained and shall ensure accessibility.

3.15 CABLE TESTS

- A. Contractor shall perform testing of all pairs for each cable installed as directed by these specifications. Post construction cable acceptance tests consist of conductor continuity tests, and conductor insulation resistance tests. These tests assure that the cable has been terminated properly and has not been damaged during construction. An Owner's representative will be required to witness these tests.
- B. Each cable pair shall be tested for shorts (T to R and T&R to ground), continuity, and loop resistance. Maximum loop resistance from the main telephone/data panel to each jack shall be within 5% of the calculated value based on the actual length of cable installed, and the loop ohms/1000 ft. for copper conductors.

3.16 DEFECTIVE CABLE PAIRS

- A. The vendor shall test all cable pairs and shall record, on the pair assignment record, the nature of the defect for each pair found to be defective and remedies used to clear the defect. In order for the cable distribution system to be considered acceptable, there shall be no defective pairs in any cable. Any cable having defective pairs shall not be used and shall be replaced at Contractor's expense.

3.17 INSPECTIONS

- A. Routine on-site construction inspections by the Architect/Engineer and/or an Owner's representative will involve trips to the complex to inspect construction, so as to assure adherence to standard construction practices. The number of such inspections will be at the Architect/Engineer's discretion.

3.18 ACCEPTANCE

- A. The project shall be considered acceptable based upon the following:
 - 1. Contractor has furnished and installed all equipment and materials and performed all work in accordance with these specifications.
 - 2. Contractor has successfully completed all the required testing, assuring compliance with the required specifications.
 - 3. Contractor has removed all trash and debris by contractor from the area and restored site to original condition.
 - 4. Contractor has submitted the required documentation to state officials.

END OF SECTION 28 05 13

SECTION 310513 - SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Subsoil.
2. Topsoil.

B. Related Requirements:

1. Section 310516 "Aggregates for Earthwork" for coarse and fine aggregate materials.
2. Section 312213 "Rough Grading" for removal of topsoil, rough grading, and filling associated with contouring of Site.
3. Section 312316 "Excavation" for excavating as required for building foundations and utilities within building perimeter.
4. Section 312316.13 "Trenching" for excavating as required for building foundations and utilities within building perimeter.
5. Section 312323 "Fill" for backfilling as required at building perimeter and Site structures to subgrade elevations.
6. Section 312500 "Erosion and Sedimentation Controls" for slope protection and erosion control.
7. Section 313213.16 "Cement Soil Stabilization" for treatment of existing Site subsoil for physical stability and to encourage stabilization prior to placement of subsequent construction.
8. Section 313213.19 "Lime Soil Stabilization" for treatment of existing Site subsoil for physical stability and to encourage stabilization prior to placement of subsequent construction.
9. Section 313716.13 "Rubble-Stone Riprap" for riprap and rock lining placed loose for soil stabilization and slope protection.
10. Section 313716.19 "Sacked Sand-Cement Riprap" for riprap and rock lining used for soil stabilization and slope protection.
11. Section 320513 "Soils for Exterior Improvements" for subsoil and topsoil materials.
12. Section 320516 "Aggregates for Exterior Improvements" for coarse and fine aggregate materials.
13. Section 329219 "Seeding" for fertilizing, seeding, hydroseeding, mulching, and maintenance.

1.2 SUBMITTALS

A. Product Data:

1. Subsoil.
2. Topsoil.

- B. Samples: Submit, in airtight containers, 10-lb. sample of each type of Type fill to testing laboratory.
- C. Source Quality-Control Reports: For subsoil and topsoil materials.

1.3 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 SUBSOIL

- A. Type S1: Comply with LA DOTD, Section 203 Standards.
 - 1. Free of organic or other deleterious materials.
 - 2. Have a maximum particle size less than 2 inches.
 - 3. Conforms to the physical characteristics of soils designated as CL under ASTM D-2487.
 - 4. Liquid Limit: 42 or less.
 - 5. Plasticity Index: Between 10 and 22.
- B. Type S2 Ordinary Borrow:
 - 1. Ordinary borrow consists of well-graded mineral soil substantially free of organic materials, loam, wood, trash, and other objectionable material which may be compressible or which cannot be compacted properly.
 - 2. Ordinary borrow consist of a material satisfactory to the Architect or Engineer and not specified as gravel borrow, sand borrow, special borrow material, or other particular kind of borrow.
 - 3. This material conforms to the physical characteristics of soils designated as group A-1, A-2-4, or A-3 under AASHTO M 145.
 - 4. Must be readily spread and compacted for the formation of foundations, embankments, and other subgrade improvements.
 - 5. Liquid Limit: A-1 and A-3 = none or not measured, A-2-4 = 40 max.
 - 6. Plasticity Index: A-1 = 6 max, A-3 = Non-Plastic (NP), A-2-4 = 10 max.
- C. Type S2-a Special Borrow:
 - 1. Special borrow consists of one or all of the following:
 - a. A native in-situ soil that is classified under AASHTO M 145 as A-3, or that portion of A-1 and A-2 with less than 12 percent passing the No. 200 sieve as determined by AASHTO T 311.

b. A crushed rock from approved source, that meets the following requirements:

- 1) Percent of Wear LA Abrasion Test: 50 percent.
- 2) Maximum Plasticity Index: 6 percent.

c. Percent Passing According to Sieve Size:

- 1) 3 Inches (75 mm): 100.
- 2) 2 Inches (50 mm): 90 to 100.
- 3) No. 4 (4.75 mm): 100 to 60.
- 4) No. 200 (75 micro m): 0 to 12.

D. Type S2-b Pipe Bedding Material and Drainage Layer:

1. Bedding and drainage material under loam and around utilities is comprised of natural mineral sand within the following gradation limits:

a. Percent Passing According to Sieve Size:

- 1) 1/2 Inch (12 mm): 100.
- 2) 3/8 Inch (10 mm): 100 to 85.
- 3) No. 4 (4.75 mm): 100 to 60.
- 4) No. 16 (1.18 mm): 80 to 35.
- 5) No. 50 (300 micro m): 55 to 10.
- 6) No. 200 (75 micro m): 10 to 2.

E. Type S2-c Granular Fill:

1. Granular fill consists of sandy gravel or gravelly sand, free of organic material, loam, snow, ice, frozen soil, and other objectionable materials, well-graded within the following limits:

a. Percent Passing According to Sieve Size:

- 1) 4 Inches (100 mm): 100.
- 2) 1/2 Inch (12 mm): 85 to 50.
- 3) No. 4 (4.75 mm): 75 to 40.
- 4) No. 100 (150 micro m): 30 to 5.
- 5) No. 200 (75 micro m): 20 to 0.

F. Type S2-d Structural Fill:

1. Structural fill consists of processed fill material that is hard durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. Gradation requirements as determined by AASHTO T11 and T27 conforms to the following gradation requirements:

a. Percent Passing According to Sieve Size:

- 1) 3 Inches (75 mm): 100.
- 2) 1/2 Inch (12 mm): 50 to 85.

- 3) No. 4 (4.75 mm): 40 to 75.
- 4) No. 50 (300 micro m): 8 to 28.
- 5) No. 200 (75 micro m): 0 to 8.

G. Type S2-e Reclaimed Pavement Borrow Material:

- 1. Reclaimed pavement borrow material consists of crushed asphalt pavement or crushed cement concrete, and gravel borrow.
- 2. Provide material free of loam, clay, and deleterious materials such as brick, reinforcing steel, wood, paper, plaster, lathing, and building rubble.
- 3. Provide coarse aggregate with a percentage of wear not greater than 50 percent as measured by the Los Angeles Abrasion Test.
- 4. Determine gradation requirements in accordance with AASHTO T 311, except the material cannot be oven dried. Dry material by air drying, fan drying at low speed, or other low temperature heat so as not to liquefy the asphalt or cause the asphalt to adhere to the sieves. Water used for the No. 200 sieve analysis must be cold tap water.
- 5. The gradation requirements for reclaimed pavement borrow are as follows:
 - a. Percent Passing According to Sieve Size:
 - 1) 3 Inches (75 mm): 100.
 - 2) 1-1/2 Inches (37.5 mm): 70 to 100.
 - 3) 3/4 Inch (19 mm): 50 to 85.
 - 4) No. 4 (4.75 mm): 30 to 60.
 - 5) No. 50 (300 micro m): 8 to 24.
 - 6) No. 200 (75 micro m): 0 to 10.
- 6. The liquid limit for the portion of materials passing the No. 40 sieve cannot be greater than 25 and the plasticity index not greater than 6.
- 7. Compact the reclaimed pavement borrow to a minimum of 95 percent of AASHTO T 180 proctor density.
- 8. Determine liquid limits by AASHTO T 90.
- 9. Process reclaimed pavement borrow material by mechanical means and blended to form a homogeneous material. Provide equipment for producing crushed material of adequate size and having sufficient adjustments to produce the desired materials. Blended materials that are stockpiled for more than three months will require rework to provide a uniform material and must be retested prior to use; however, the Architect or Engineer may require additional testing any time the materials appear excessively hard, wet, or segregated.
- 10. Provide reclaimed pavement borrow material from Architect or Engineer approved sources and stockpiles.
- 11. The amount of combined crushed asphalt pavement and crushed cement concrete should not exceed 50 percent by volume as determined by visual inspection, or by laboratory tests required by the Architect or Engineer.

2.3 TOPSOIL

- A. Comply with LA DOTD, Section 715 Standard.

2.4 SOURCE QUALITY CONTROL

A. Testing and Analysis:

1. Subsoil or Topsoil Materials: Perform according to LA DOTD.
2. If tests indicate materials do not meet specified requirements, change material and retest.

B. Inspection:

1. Make subsoil and topsoil available for inspection at source prior to shipment.
2. Notify Architect, Engineer or Representative at least seven days before inspection is allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

- #### A.
- Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION OF SUBSOIL AND TOPSOIL

A. Excavation:

1. Excavate subsoil and topsoil from designated areas.
2. Strip topsoil to full depth of topsoil in designated areas.
3. Remove excess excavated materials, subsoil, and topsoil not intended for reuse from Site.
4. Remove excavated materials not meeting requirements for subsoil and topsoil materials from Site.

B. Stockpiling:

1. Stockpile excavated material meeting requirements for subsoil and topsoil materials.
2. Stockpile materials on Site at locations as indicated or designated by Architect or Engineer.
3. Stockpile in sufficient quantities to meet Project schedule and requirements.
4. Separate differing materials with dividers or stockpile apart to prevent intermixing of soil types or contamination.
5. Stockpile topsoil maximum 8 feet high.
6. Direct surface water away from stockpile to prevent erosion or deterioration of materials.

3.3 CLEANING

A. Stockpile:

1. Remove stockpile and leave area in clean and neat condition.

- a. Grade Site surface to prevent freestanding surface water.

END OF SECTION 310513

SECTION 310516 - AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coarse aggregate.
2. Fine aggregate.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for granular fill, topsoil, and grading materials.
2. Section 312213 "Rough Grading" for removal of topsoil, rough grading, and filling associated with contouring of Site.
3. Section 312316 "Excavation" for excavating as required for building foundations and utilities within building perimeter.
4. Section 312316.13 "Trenching" for excavating as required for building foundations and utilities within building perimeter.
5. Section 312323 "Fill" for backfilling as required at building perimeter and Site structures to subgrade elevations.
6. Section 312500 "Erosion and Sedimentation Controls" for slope protection and erosion control.
7. Section 313213.16 "Cement Soil Stabilization" for treatment of existing Site subsoil for physical stability and to encourage stabilization prior to placement of subsequent construction.
8. Section 313213.19 "Lime Soil Stabilization" for treatment of existing Site subsoil for physical stability and to encourage stabilization prior to placement of subsequent construction.
9. Section 313716.13 "Rubble-Stone Riprap" for riprap and rock lining placed loose for soil stabilization and slope protection.
10. Section 313716.19 "Sacked Sand-Cement Riprap" for riprap and rock lining used for soil stabilization and slope protection.
11. Section 320513 "Soils for Exterior Improvements" for subsoil and topsoil materials.
12. Section 320516 "Aggregates for Exterior Improvements" for coarse and fine aggregate materials.
13. Section 321123 "Aggregate Base Courses" for subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.
14. Section 321416 "Brick Unit Paving" for pavers of various profiles and sizes for exterior application.
15. Section 321440 "Stone Paving" for marble, granite, or slate stone pavers to be laid on sand or cementitious bed.
16. Section 331416 "Site Water Utility Distribution Piping" for pipe materials, fittings, valves, meters, and backflow preventers.
17. Section 333100 "Sanitary Sewerage Piping" for pipe materials and accessories normally encountered with gravity sanitary building piping.

18. Section 334200 "Stormwater Conveyance" for drainage facilities to collect and provide for the flow of stormwater.

1.2 SUBMITTALS

- A. Product Data:
 1. Fine aggregate.
 2. Coarse aggregate.
 3. Submit name of imported materials source.
- B. Samples: Submit, in airtight containers, 10-lb. sample of each type of aggregate to testing laboratory.
- C. Source Quality-Control Reports: For fine- and coarse-aggregate materials.

1.3 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 COARSE AGGREGATE

- A. Type A1: Comply with LA DOTD, Sections 1003.01, 1003.03.1 or 1003.03.2 standards.
- B. Type A2 Gravel Borrow:
 1. Gravel borrow consists of processed inert fill material that is hard durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. Gradation requirements are determined by AASHTO T11 and T27 and conform to the following gradation:
 - a. Percent Passing According to Sieve Size:
 - 1) 2 Inches (50 mm): 100.
 - 2) 1/2 Inch (12.7 mm): 50 to 85.
 - 3) No. 4 (4.75 mm): 40 to 75.
 - 4) No. 50 (300 micro m): 8 to 28.
 - 5) No. 200 (75 micro m): 0 to 8.
 - 6) Liquid Limit: Not greater than 25.
 - 7) Plasticity Index: Not greater than 6, according to ASTM D4318.

C. Type A3 Crushed Stone:

1. Crushed stone consists of one of the following materials:
 - a. Durable crushed rock consisting of angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated, or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15 percent of the total weight.
 - 1) Thin stones are considered to be such stones whose average width exceeds four times their average thickness. Elongated stones are considered to be such stones whose average length exceeds four times their average width.
 - b. Durable crushed gravel stone obtained by artificial crushing of gravel boulders or fieldstone with a minimum diameter before crushing of 8 inches.
2. Provide crushed stone reasonably free from clay, loam, or deleterious material with not more than 1.0 percent of satisfactory material passing a No. 200 sieve allowed to adhere to the crushed stone. Where crushed stone is to be used for surfacing, this requirement shall be not more than 0.5 percent of satisfactory material passing a No. 200 sieve.
 - a. Percent Passing According to Sieve Size:
 - 1) 1-1/2 Inches (37.5 mm): 100.
 - 2) 1-1/4 Inches (31.75 mm): 85 to 100.
 - 3) 3/4 Inch (19 mm): 10 to 40.
 - 4) 1/2 Inch (12 mm): 0 to 8.

D. Type A3a Dense Graded Crushed Stone for Sub-base:

1. Graded crushed stone for sub-base material combines crusher-run coarse aggregates of crushed stone and fine aggregates uniformly premixed with a predetermined quantity of water. Coarse aggregate consists of hard, durable particles of fragments of stone. Materials that break up when alternately frozen and thawed or wetted and dried are not acceptable. Provide coarse aggregate with a percentage of wear, by the Los Angeles Abrasion Test, of not more than 45. Fine aggregate consists of natural or crushed sand. Provide the composite material free from clay, loam, or other plastic material, which conforms to the following gradation requirements:
 - a. Percent Passing According to Sieve Size:
 - 1) 2 Inches (50 mm): 90 to 100.
 - 2) 1-1/2 Inches (37.5 mm): 70 to 100.
 - 3) 3/4 Inch (19 mm): 50 to 85.
 - 4) No. 4 (4.75 mm): 30 to 55.
 - 5) No. 50 (300 micro m): 8 to 24.
 - 6) No. 200 (75 micro m): 3 to 10.

E. Type A4 Pea Gravel:

1. Stone: Natural and washed.

2. Quality: Free of clay, shale, and organic matter.
3. Grading:
 - a. Comply with ASTM C136/C136M, ASTM D2487; Group Symbol GM or GC.
 - b. Minimum Size: 1/4 inch.
 - c. Maximum Size: 5/8 inch.

2.3 FINE AGGREGATE

- A. Type A5: Comply with LA DOTD, Sections 1003.01 and 1003.09 standards.
- B. Type A6 Natural River or Bank Sand, Washed:
 1. Quality: Free of silt, clay, loam, friable or soluble materials, and organic matter.
 2. Grading: Comply with ASTM C136/C136M, ASTM D2487; Group Symbol SW.
 3. Percent Passing According to Sieve Size:
 - a. No. 4 (4.75 mm): 100.
 - b. No. 14 (1.4 mm): 10 to 100.
 - c. No. 50 (300 micro m): 5 to 90.
 - d. No. 100 (150 micro m): 4 to 30.
 - e. No. 200 (75 micro m): Zero.
- C. Type A7 Blended Aggregate:
 1. Produce blended aggregate by intermixing two or more fine or coarse aggregates to produce an aggregate combination with improved grading or other properties.
 2. Percent Passing According to Sieve Size:
 - a. 3/8 Inch (9.5 mm): 100.
 - b. 1/4 Inch (6.3 mm): 98 to 100.
 - c. No. 4 (4.75 mm): 90 to 100.
 - d. No. 10 (2.000 mm): 56 to 76.
 - e. No. 20 (850 micro m): 40 to 54.
 - f. No. 40 (425 micro m): 25 to 45.
 - g. No. 80 (180 micro m): 13 to 29.
 - h. No. 200 (75 micro m): 4 to 10.

2.4 RECLAIMED ASPHALT PAVEMENT (RAP)

- A. Type A8: Comply with LA DOTD, Sections 1003.01.3.2 and 1003.06.5 standards.

2.5 SOURCE QUALITY CONTROL

- A. Testing and Analysis:
 1. Coarse or Fine Aggregate Materials: Perform according to LA DOTD.
 2. If tests indicate materials do not meet specified requirements, change material and retest.

B. Inspection:

1. Make coarse aggregate and fine aggregate available for inspection at source prior to loading for shipment.
2. Notify Architect, Engineer or Representative at least seven days before inspection is allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION OF COARSE AGGREGATE AND FINE AGGREGATE

A. Stockpiling:

1. Stockpile materials on Site at locations as indicated designated by Architect or Engineer.
2. Stockpile excavated material meeting requirements for coarse-aggregate and fine-aggregate materials.
3. Stockpile in sufficient quantities to meet Project schedule and requirements.
4. Separate different aggregate materials with dividers or stockpile apart to prevent intermixing of aggregate types or contamination.
5. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 CLEANING

A. Stockpile:

1. Remove stockpile and leave area in clean and neat condition.
 - a. Grade Site surface to prevent freestanding surface water.

END OF SECTION 310516

SECTION 310519.13 - GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Woven turf reinforcement mats (TRMs).
2. Nonwoven geotextile materials.
3. Woven geotextiles for erosion control.
4. Woven geotextiles for paved and unpaved roads.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for fill and grading materials.
2. Section 310516 "Aggregates for Earthwork" for fill and base coarse materials, and for fill over woven geotextiles at roadway applications.
3. Section 312316.13 "Trenching" for soil and subsoil materials for fill and grading purposes.
4. Section 312323 "Fill" for backfilling required at building perimeter and Site structures to subgrade elevations; fill under slabs on grade, pavement, and landscaped areas.
5. Section 312500 "Erosion and Sedimentation Controls" for erosion and sedimentation control devices.
6. Section 320513 "Soils for Exterior Improvements" for soil and subsoil materials for fill and grading purposes.
7. Section 320516 "Aggregates for Exterior Improvements" for coarse and fine aggregate materials for fill and grading purposes.
8. Section 321123 "Aggregate Base Courses" for subbase and base course for placement under paving.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Woven turf reinforcement mats (TRMs).
2. Nonwoven geotextile materials.
3. Woven geotextiles for erosion control.
4. Woven geotextiles for paved and unpaved roads.
5. Submit manufacturer information including tensile strength, elongation, thickness, UV resistance, and other material specifications.
6. Submit testing agency compliance with the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP).

B. Shop Drawings:

1. Indicate fabric layout, seam locations, and overlap details in installation drawings.

2. Seaming Procedures: When a field-sewn seam is required, use high-strength polypropylene or polyester threads. Do not use nylon thread. Comply with ASTM D4884. Use the following guidelines for seams sewn in the field:
 - a. Provide a minimum length of 6.56 feet of the sewn seam for sampling by the Architect/Engineer prior to geotextile installation.
 - b. Provide sample using the same equipment and procedures utilized in production of the geotextile.
 - c. Submit the seam assembly description, including the seam type, stitch type, sewing thread, and stitch density, along with the sample of the seam.
3. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples:

1. If requested, submit two samples, 36 inches wide by 36 inches long, for each type and weight of geotextile used on Project, illustrating thickness and seaming method.
2. Submit one sample of securing pin and washer.

D. Source Quality-Control Reports: For TRMs and woven and nonwoven geotextiles.

E. Qualifications Statements: For manufacturer, installer, and testing agency.

1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of geotextile materials, including placement depth.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' experience.
- B. Licensed Professionals Qualifications: Professional engineer experienced in design of specified Work and licensed in State of Louisiana.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Comply with ASTM D4873.
- C. Store materials according to manufacturer instructions.
- D. Protection:
1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).
- B. Ensure that terminology incorporated herein complies with ASTM D4439.

2.2 WOVEN TURF REINFORCEMENT MATS (TRMS)

- A. Provide turf reinforcement mats (TRMs) with sufficient thickness, optimum open area, and three-dimensionality for effective erosion control and vegetation reinforcement against high flow-induced shear forces. Provide material that has high interlock and reinforcement capacity with both soil and root systems and is designed for erosion control applications on steep slopes and vegetated waterways.
- B. Furnish materials according to LA DOTD standards.
- C. Non-biodegradable, UV-resistant, woven geotextile fabric.
- D. Edges: Selvaged or finished to prevent separation of outer material.
- E. Calendar such that yarns will retain relative positions.
- F. Performance and Design Criteria:
 1. Comply with AASHTO M 288.
 2. Mass per Unit Area:
 - a. 14.0 oz./sq. yd.
 - b. Comply with ASTM D6566.
 3. Thickness:
 - a. 0.40 inch.
 - b. Comply with ASTM D6525/D6525M.
 4. Light Penetration:
 - a. Light Passing: 75 percent.
 - b. Comply with ASTM D6567.
 5. Tensile Strength (Grab):
 - a. 4,000 by 3,000 lb./ft.
 - b. Comply with ASTM D4632/D4632M or D6818.

6. Maximum Elongation:
 - a. 40 by 35 percent.
 - b. Comply with ASTM D6818.
7. Resiliency:
 - a. 80 percent.
 - b. Comply with ASTM D6524/D6524M.
8. Average Flexibility:
 - a. 0.534 IP.
 - b. Comply with ASTM D6575/D6575M.
9. UV Resistance at 6,000 Hours:
 - a. Strength Retention: 90 percent.
 - b. Comply with ASTM D4355/D4355M.
10. Velocity Performance:
 - a. Velocity (Vegetated): 25 fps.
11. Seeding Emergence:
 - a. 296 percent.
 - b. Comply with ASTM D7322

2.3 NONWOVEN GEOTEXTILE MATERIALS

- A. Provide nonwoven geotextile that meets AASHTO M 288 Class 3 requirements for subsurface drainage, separation, and stabilization. Provide multipurpose fabrics with a felt-like appearance. The main functions for these products are filtration and separation. The most common nonwoven is a needle-punched product. Staple fibers or continuous filaments are bonded by mechanically entangling the fibers with barbed needles. Their optimum open area and three-dimensionality provide effective erosion control and vegetation reinforcement, as well as resistance against high flow-induced shear forces. Provide material that has high interlock and reinforcement capacities with both soil and root systems and is designed for erosion control applications on steep slopes and vegetated waterways.
- B. Furnish materials according to LA DOTD standards.
- C. Non-biodegradable, UV-resistant, nonwoven geotextile fabric.
- D. Edges: Salvaged or finished to prevent separation of outer material.
- E. Calendar such that yarns will retain relative positions.
- F. Performance and Design Criteria:

1. Minimum Unseamed Sheet Width: 12.5 by 15 feet.
2. Nominal Weight: 4.2 oz./sq. yd.
3. Apparent Opening Size (AOS):
 - a. No 70 U.S. standard sieve size.
 - b. Comply with ASTM D4751.
4. Water Permittivity: 1.70 Hz per second, minimum average roll value.
5. Water Flow Rate:
 - a. 135 gpm/sq. ft., minimum average roll value.
 - b. Comply with ASTM D4491/D4491M.
6. Grab Tensile Strength:
 - a. 120 lbf, minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
7. Elongation:
 - a. 50 percent, minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
8. Trapezoidal Tear Strength:
 - a. 50 lbf minimum average roll value.
 - b. Comply with ASTM D4533/D4533M.
9. Puncture Strength:
 - a. 310 lbf minimum average roll value.
 - b. Comply with ASTM D6241.
10. UV Resistance at 500 Hours:
 - a. Strength Retention: 70 percent.
 - b. Comply with ASTM D4355/D4355M.

2.4 WOVEN GEOTEXTILES FOR EROSION CONTROL

- A. Provide woven geotextile that meets AASHTO M 288 Class 2 and 3 (less than 15 percent fines) for permanent erosion control and subsurface drainage. Provide woven monofilament filtration geotextile made of 100 percent polypropylene yarns. Provide woven geotextile with opening area of 4 to 6 percent to provide excellent hydraulic properties and reduce clogging.
- B. Furnish materials according to LA DOTD standards.
- C. Non-biodegradable, UV-resistant, woven geotextile fabric.
- D. Edges: Selvaged or finished to prevent separation of outer material.

E. Calendar such that yarns will retain relative positions.

F. Performance and Design Criteria:

1. Roll Dimension: 12.5 by 300 feet.
2. Nominal Roll Weight: 176 lb.
3. Apparent Opening Size (AOS):
 - a. No. 70 U.S. standard sieve size.
 - b. Comply with ASTM D4751.
4. Water Permittivity: 0.28 Hz per second, minimum average roll value.
5. Water Flow Rate:
 - a. 18 gpm/sq. ft., minimum average roll value.
 - b. Comply with ASTM D4491/D4491M.
6. Grab Tensile Strength:
 - a. 370 by 250 lb., minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
7. Elongation:
 - a. 15 percent, minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
8. Trapezoidal Tear Strength:
 - a. 100 by 60 lb., minimum average roll value.
 - b. Comply with ASTM D4533/D4533M.
9. Puncture Strength:
 - a. 950 lb., minimum average roll value.
 - b. Comply with ASTM D6241.
10. UV Resistance at 500 Hours:
 - a. Strength Retention: 90 percent.
 - b. Comply with ASTM D4355/D4355M.
11. Percent Open Area:
 - a. 4 percent.
 - b. Comply with Corps of Engineers (COE) - 02215.

2.5 WOVEN GEOTEXTILES FOR PAVED AND UNPAVED ROADS

- A. Provide woven geotextile which meets AASHTO M 288 Class 1. Provide road fabric that separates and stabilizes materials. Provide flexible, porous geotextile placed between different

materials so that both materials can either function properly or have improved functionality. Geotextile road fabrics prevent rutting and erosion, allowing water to flow through gravel or a thin layer of sediment to the soil and dirt underneath.

- B. Furnish materials according to LA DOTD standards.
- C. Non-biodegradable, UV-resistant, woven geotextile fabric.
- D. Edges: Selvaged or finished to prevent separation of outer material.
- E. Calendar such that yarns will retain relative positions.
- F. Performance and Design Criteria:
 - 1. Weight:
 - a. 6.3 oz./sq. yd.
 - b. Comply with ASTM D5261.
 - 2. Apparent Opening Size (AOS):
 - a. No. 43 U.S. standard sieve size.
 - b. Comply with ASTM D4751.
 - 3. Water Permittivity: 0.05 Hz per second, minimum average roll value.
 - 4. Water Flow Rate:
 - a. 4 gpm/sq. ft., minimum average roll value.
 - b. Comply with ASTM D4491/D4491M.
 - 5. Grab Tensile Strength:
 - a. 315 lb., minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
 - 6. Grab Elongation:
 - a. 15 percent, minimum average roll value.
 - b. Comply with ASTM D4632/D4632M.
 - 7. Trapezoidal Tear Strength:
 - a. 120 lb., minimum average roll value.
 - b. Comply with ASTM D4533/D4533M.
 - 8. California Bearing Ratio (CBR) Puncture Strength:
 - a. 1,000 lb., minimum average roll value.
 - b. Comply with ASTM D6241.
 - 9. UV Resistance at 500 Hours:

- a. Strength Retention: 70 percent.
- b. Comply with ASTM D4355/D4355M.

2.6 ACCESSORIES

A. Sewing Thread:

- 1. Material: Polypropylene Polyester or Kevlar.
- 2. Durability: Equal to or greater than durability of geotextile.

B. Securing Pins:

- 1. Material: Steel rods or bars.
- 2. Diameter: 3/16 inch.
- 3. Minimum Length: 12 inches.
- 4. Washers:
 - a. Material: Steel.
 - b. Outside Diameter: Minimum 1-1/2 inches.
 - c. Inside Diameter: 1/4 inch.
 - d. Thickness: 1/8 inch.

C. Wire Staples:

- 1. Material: Steel.
- 2. Minimum Size: 10 gage.
- 3. Minimum Length: 6 inches.

2.7 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of completed assembly. Provide sampling of geosynthetics for testing in compliance with ASTM D4354.

B. Inspection:

- 1. Notify Architect, Engineer or Representative at least seven days before inspection is allowed.

C. Certificate of Compliance:

- 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents and GAI-LAP.
- 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that underlying surface is smooth and free of ruts or protrusions that could damage geotextile material.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Subgrade Material and Compaction Requirements: As specified in Section 310516 – Aggregates for Earthwork.

3.3 INSTALLATION OF GEOTEXTILES

A. Geotextile Material:

- 1. Lay and maintain smooth and free of tensile stresses, folds, wrinkles, or creases.
- 2. Ensure that material is in direct contact with subgrade.
- 3. Orientate with long dimension of each sheet as shown or directed to direction of slope.
- 4. Minimum Unseamed Joints Overlap: 18 inches.

B. Securement Pins:

- 1. Insert through geotextile midway between edges of overlaps and minimum 6 inches from free edges.
- 2. Minimum Spacing:
 - a. Slopes Steeper than 3 Horizontal on 1 Vertical: 24 inches o.c.
 - b. Slopes 3 Horizontal on 1 Vertical to 4 Horizontal on 1 Vertical: 3 feet o.c.
 - c. Slopes Flatter than 4 Horizontal on 1 Vertical: 5 feet o.c.
- 3. Ensure that washer bears against geotextile.

C. Seams:

- 1. Minimum Seamed Joints Overlap: 12 inches at longitudinal and transverse joints.
- 2. Seams across Slope: Lap upper panel over lower panel.
- 3. Sewn Seams:
 - a. Continuously sew seams on slopes at locations indicated on Drawings.
 - b. Stitch Type: As recommended by geotextile manufacturer.
 - c. Tie off thread at the end of each seam to prevent unraveling.
- 4. Thermal Seams:

- a. As recommended by geotextile manufacturer.
 - b. Comply with ASTM D4886.
- D. Penetrations: As indicated on Drawings or recommended by geotextile manufacturer.
- E. Repair Damaged Geotextiles:
 - 1. Repair torn or damaged geotextile by placing patch of same type of geotextile over damaged area minimum of 12 inches beyond edge of damaged area and fasten as recommended by geotextile manufacturer.
 - 2. Remove and replace geotextile rolls which cannot be repaired.
- F. Fill and Cover:
 - 1. Place fill to prevent tensile stress or wrinkles in geotextile.
 - 2. Place fill from bottom of side-slopes upward.
 - 3. Do not drop fill from height greater than 3 feet.

3.4 FIELD QUALITY CONTROL

- A. Testing: Perform according to LA DOTD.

3.5 DEMONSTRATION

- A. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 4 days on Site for installation, field testing, and inspection.
- B. Equipment Acceptance:
 - 1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
 - 2. Make final adjustments to equipment under direction of manufacturer's representative.

3.6 PROTECTION

- A. Ballast: Adequate to prevent uplift of material by wind.
- B. UV Exposure: Do not leave material uncovered for more than 14 days after installation.
- C. Do not use staples or pins to hold geotextiles in place where located adjacent to other geosynthetic layers that could be damaged.
- D. Do not operate equipment directly on top of geotextiles.

END OF SECTION 310519.13

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing surface debris.
2. Removing designated paving and curbs.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned water, sewer or drainage utilities.

B. Related Sections:

1. Section 015639 - Temporary Tree and Plant Protection.
2. Section 312213 - Rough Grading.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.3 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site or use of herbicides.

B. Perform Work in accordance with State and Municipality standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Herbicide: Indicate type, approved by authority having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify waste/disposal or salvage area for placing removed materials.

3.2 PREPARATION

- A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify, and protect from damage utilities indicated to remain.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 015000 - Temporary Facilities and Controls.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

- A. Clear areas required for access to site and execution of Work to minimum depth of 3 inches.
- B. Remove trees and shrubs within marked areas indicated. Remove stumps, main root ball, root system to a minimum depth of 36 inches or as directed.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove paving, curbs, and other items as indicated on Drawings. Neatly saw cut edges at right angle to surface.

- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

END OF SECTION 311000

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PART 1 GENERAL

1.01 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. Geotechnical Investigation by SITE Engineering, Inc., dated November 8, 2023. Geotechnical report may be obtained from Architect's office.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for buildings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Excavating and backfilling for utility trenches.
 - 6. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 03 Section "Cast-in-Place Concrete".

1.03 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Drainage Course: Course beneath the slab that minimizes upward capillary flow of pore water.
- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.04 SUBMITTALS

- A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
 - 2. Test reports on borrow material.
 - 3. Field density test reports.
 - 4. One optimum moisture-maximum density curve for each type of soil encountered.



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- 1.05 QUALITY ASSURANCE
- A. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction.
 - B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
 - C. Testing & Inspection Service: Owner will engage and pay for soil testing and inspection service for quality control testing during earthwork operations. Contractor shall pay for all retesting of failed tests.
- 1.06 PROJECT CONDITIONS
- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
 - B. Existing Utilities: Locate existing underground utilities before performing earthwork. If utilities are to remain in place, provide protection from damage during earthwork operations.
 - C. Interruption of Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
 - D. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 PRODUCTS

- 2.01 SOIL MATERIALS
- A. Satisfactory Soils:
 - 1. Imported soil fill material used to raise the site grade should be either a low plasticity silty or sandy clay (USCS Classification, CL) or a clayey sand (SC), shall be free of roots, construction debris, organic matter or any other deleterious materials, have a maximum clay lump size less than two (2) inches and have a liquid limit of less than 45 and a plasticity index value between 10 and 25. If a fine-grained sandy clay soil is used for select fill, close moisture content control will be required to achieve the recommended degree of compaction.
 - B. Unsatisfactory Soils: Soils other than satisfactory soils.
 - 1. Unsatisfactory soils also include **satisfactory soils not maintained within -2 to +3 percentage points of the optimum moisture content at time of compaction as determined by the Standard Proctor test (ASTM D 698).**
 - C. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
 - D. Drainage Course: Provide a stone drainage layer (per list below) at contractor's option beneath the concrete slab and vapor retarder.
 - 1. A 4" thick layer number 8 washed gravel per ASTM C33, complying with the following gradation:

Sieve Size	Percent Passing
1/2"	100
3/8"	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5
 - 2. A 4" thick layer of number 57 crushed and washed limestone per ASTM C33, complying with the following gradation:

Sieve Size	Percent Passing
1-1/2"	100

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1"	95 to 100
1/2"	25 to 60
No. 4	0 to 10
No. 8	0 to 5

2.02 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. In order to prepare the building and pavement areas for fill or for insitu soils to be used as a final subgrade, the site shall be stripped of all vegetation, soft or loose surface soils, obstructions and all deleterious materials. This includes any loose or water-softened surface materials.
 - 1. When trees are removed, the entire root ball should be excavated such that the remaining roots measure 1 inch in diameter, or less.
 - 2. Strip 6 inches of topsoil minimum at building pad and within 10 feet of the building. Additional stripping may be required in some areas. The actual removal depth shall be determined in the field by the Testing Agency.
- C. Additional information for preparation requirements of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface, and treatment or improvement are specified in Division 2 Section "Site Clearing." Also refer to Geotechnical Investigation for additional information on site work and subgrade preparations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.
- E. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated materials as directed by Architect.
- F. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction (including all OSHA requirements). Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

3.02 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

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- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- 3.03 EXPLOSIVES
 - A. Explosives: Do not use explosives.
- 3.04 EXCAVATION, GENERAL
 - A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - B. Avoid opening excavations during inclement weather.
 - C. Excavations shall not have deleterious effects on adjacent foundations or structures. Sequence construction as required to avoid deep excavations adjacent to foundations or structures, or when deep excavations adjacent to foundations or structures are unavoidable, provide temporary shoring as required in consultation with Geotechnical Engineer.
- 3.05 EXCAVATION FOR STRUCTURES
 - A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
 - 3. The base of all excavations for structures shall be free of water, loose soil, unsuitable bearing materials including soft soil, and other foreign materials.
- 3.06 EXCAVATION FOR WALKS AND PAVEMENTS
 - A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.
- 3.07 EXCAVATION FOR UTILITY TRENCHES
 - A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 - B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
 - C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 8 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 8 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

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Alternatively, excavate the trench 6" deeper than the bottom of the pipe and provide 6" bedding course.

3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.08 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll existing subgrade (after preparation as noted above is complete) below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 1. Contact Architect, Engineer, and Testing Agency 48 hours prior to proof-rolling. A representative of the Testing Agency must be on site during proof-rolling operations.
 2. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
 3. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 4. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Testing Agency and as directed by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.09 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2000 psi, may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with a lean concrete fill to elevation of bottom of footings. Provide a lean concrete fill with a 28-day compressive strength of 2500 psi.

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- D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- G. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- H. All utility trenches that penetrate the building shall be effectively sealed to restrict water intrusion and flow through trenches that could migrate below the building. An effective clay "trench plug" that extends at least five (5) feet out from the face of the building exterior shall be constructed at each utility trench which penetrates the building perimeter. The plug material shall be a clay satisfactory soil compacted at a water content at or above the soils optimum water content. The clay satisfactory soil shall be placed to completely surround the utility line and be compacted.
- I. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use satisfactory soil material.
 - 4. Under building slabs, use satisfactory soil material.
 - 5. Under footings and foundations, use satisfactory soil material
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within -2 to +3 percentage points of the optimum moisture content at time of compaction as determined by the Standard Proctor test (ASTM D 698).
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds the optimum moisture content allowance stated above and is too wet to compact to the specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials only after the site has been proof-rolled.
- B. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- C. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- D. Compact all satisfactory soil materials to at least 95 percent of the maximum dry density as determined by the Standard Proctor compaction test (ASTM D 698). Retain applicable subparagraphs below. Percentages of maximum dry unit weight are examples only; revise to suit Project. Delete scarifying and recompacting existing subgrade when proof-rolling will suffice.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

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3. Compact grading fill materials outside of building slab limits to at least 90 percent of the maximum dry density as determined by the Standard Proctor compaction test (ASTM D 698).
 - B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1 inch.
 3. Pavements: Plus or minus 1/2 inch.
 - C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- 3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS
- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
 - B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
 1. Shape subbase and base course to required crown elevations and cross-slope grades.
 2. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
 3. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials.
- 3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE
- A. Subgrade shall be inspected by Testing Agency after compacted fill is complete and immediately prior to placement of drainage course.
 - B. Provide a drainage course using granular material as defined in part 2 of this specification.
 - C. Place drainage course on subgrades free of mud, frost, snow, or ice.
 - D. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 1. Place drainage course 6 inches or less in compacted thickness in a single layer.
 2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 3. Compact each layer of drainage course to a minimum relative density of 75 percent as per ASTM D4253.
- 3.19 FIELD QUALITY CONTROL
- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material and maximum lift thickness comply with requirements.
 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
 - B. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
 - C. Provide inspections and test in accordance with Chapter 17 of the International Building Code.
 - D. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
 - E. Testing agency will test compaction of soils in place according to ASTM D 1557, ASTM D 2167, ASTM D 2922, ASTM D 2937 and ASTM D 698, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 200 feet or less of wall length, but no fewer than 2 tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 400 feet or less of trench length, but no fewer than 2 tests.

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- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
- G. Testing agency shall verify materials below shallow foundations are adequate to achieve the design bearing capacity.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect (or Engineer); reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off of Owner's property.

END OF SECTION

SECTION 312213 - ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring and compacting for Site structures, building pads, and paving.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for soils for fill.
2. Section 310516 "Aggregates for Earthwork" for aggregates for fill.
3. Section 311000 "Site Clearing" for excavating topsoil.
4. Section 312316 "Excavation" for building excavation.
5. Section 312316.13 "Trenching" for trenching and backfilling for utilities.
6. Section 312323 "Fill" for general building area backfilling.

1.2 SUBMITTALS

- A. Samples: Submit, in airtight containers, 10-lb. sample of each type of fill to testing laboratory.
- B. Source Quality-Control Reports: For subsoil and topsoil.
- C. Material Test Reports: For each fill material, by a qualified testing agency.
- D. Field Quality-Control Reports: For fill material placement and compaction.

1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of remaining utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).
- B. Furnish each coarse- and fine-aggregate material from single source throughout Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 MATERIALS

- A. Topsoil: Comply with LA DOTD standard.
- B. Subsoil Fill: Type S1, as specified in Section 310513 "Soils for Earthwork".
- C. Structural Fill: Type S1, as specified in Section 310513 "Soils for Earthwork".
- D. Granular Fill: Type A5, A6 and A7, as specified in Section 310516 "Aggregates for Earthwork".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.
- B. Verify Site conditions under provisions of Section 013000 "Administrative Requirements".
- C. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Call local utility line information service at 811 phone number not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Notify utility company to remove and relocate utilities.
- D. Protect utilities indicated to remain free from damage.
- E. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- F. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded marked areas without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on Site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material and cover over with same material until disposal.
- D. Remove from Site excess topsoil not intended for reuse as directed by Architect/Engineer.

3.4 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded marked areas.
- B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- C. When excavating through roots, perform Work by hand and cut roots with sharp axe or a Sawzall reciprocating saw.
- D. Remove from Site excess subsoil not intended for reuse or if directed, stockpile in area designated on Site to depth not exceeding 8 feet and protect from erosion.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Place material in continuous layers as follows:
 - 1. Subsoil Fill: Maximum 8 inches compacted depth.
 - 2. Structural Fill: Maximum 6 inches compacted depth.
 - 3. Granular Fill: Maximum 6 inches compacted depth.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Slope grade away from building with a minimum 2 percent slope for minimum distance of 10 feet, unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.
- F. Repair or replace items damaged by excavation or filling.
- G. Install Work according to LA DOTD standards.

3.6 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1.2 inches from required elevation.

3.7 FIELD QUALITY CONTROL

- A. Perform laboratory material tests according to ASTM D1557.
- B. Perform in-place compaction tests according to the following:
 - 1. Density Tests: ASTM D1556 or ASTM D6938.
 - 2. Moisture Tests: ASTM D6938.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION 312213

SECTION 312316 - EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil densification.
2. Excavating for building foundations.
3. Excavating for paving, roads, and parking areas.
4. Excavating for slabs on grade.
5. Excavating for Site structures.
6. Excavating for landscaping.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for stockpiling of fill and grading materials.
2. Section 310516 "Aggregates for Earthwork" for stockpiling of coarse- and fine-aggregate materials.
3. Section 312213 "Rough Grading" for topsoil and subsoil removal from Site surface.
4. Section 312316.13 "Trenching" for excavating as required for building foundations and utilities within building perimeter.
5. Section 312323 "Fill" for backfilling at building perimeter and Site structures, and fill under slabs on grade, pavement, and landscaped areas.
6. Section 312500 "Erosion and Sedimentation Controls" for slope protection and erosion control.
7. Section 331416 "Site Water Utility Distribution Piping" for pipe materials, fittings, valves, meters, and backflow preventers.
8. Section 333100 "Sanitary Sewerage Piping" for pipe materials and accessories normally encountered with gravity sanitary building piping.

1.2 SUBMITTALS

A. Shop Drawings:

1. Indicate soil densification grid for each size and configuration footing requiring soil densification.
2. Excavation Protection Plan:
 - a. Describe sheeting, shoring, and bracing materials and installation, as required, to protect excavations and adjacent structures and property.
 - b. Submit signed and sealed Shop Drawings with design calculations and assumptions to support plan.

B. Field Quality-Control Reports: For Contractor-furnished tests and inspections.

C. Qualifications Statement: For licensed professional.

1.3 QUALITY ASSURANCE

- A. Licensed Professionals Qualifications: Professional engineer experienced in design of specified Work and licensed in State of Louisiana.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.

3.2 PREPARATION

- A. Call local utility line information service at 811 phone number not less than three working days before performing Work.
- B. Request that underground utilities be located and marked within and immediately surrounding construction areas.
- C. Identify required lines, levels, contours, and data.
- D. Existing Utilities:
 - 1. Notify utility company to remove and relocate utilities.
 - 2. Protect from damage utilities indicated to remain.
- E. Protect plant life, lawns, and other features designated to remain as portion of final landscaping.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving, curbs, and survey control points from excavating equipment and vehicular traffic.
- G. Do not close or obstruct roadways without permits.
- H. Erect and maintain temporary barriers and security devices at indicated locations, including warning signs, warning lights, and similar measures, for protection of public, and existing improvements indicated to remain.

3.3 SOIL DENSIFICATION BY VIBRO-COMPACTION

- A. Before excavating Site, vibro-compact substrates below bearing surfaces for footings as indicated on Drawings.
- B. Densify existing subsoils with existing relative density rating of "compact to dense" to attain relative density rating of "very dense."
- C. Densify subsoils to depth of specified.
- D. Depth Vibrator:
 - 1. Type: Poker.
 - 2. Follower Tubes: Furnish visible marking every 12 inches to enable insertion depth measurement.
 - 3. Motion: Radial in horizontal plane.
 - 4. Data Acquisition System: Record amps or pressure of vibrator motor over time and depth.
- E. Procedure: Perform densification in presence of Architect/Engineer, directly under each footing, with vibrator inserted in grid pattern at maximum 6 feet o.c.
 - 1. Arrange compaction grid for each footing for maximum number of insertion points, and with outermost insertion points within bearing area of footings.
 - 2. Adjust compaction grid arrangement and spacing as directed by Architect/Engineer to achieve required densification.
 - 3. Insert vibrator to maximum specified depth, densify soils for 30 seconds or other amount of time as directed by Architect/Engineer, and withdraw vibrator every 12 inches while repeating densification at each increment.
 - 4. If subsurface obstruction prevents vibrator insertion to specified depth, request instructions from Architect/Engineer to compensate for obstruction.

3.4 TOLERANCES

- A. Maximum Deviation from Center of Completed Compaction: 8 inches from indicated position.
- B. Maximum Deviation from Vertical: 4 degrees during vibrator insertion.

3.5 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation Work.
- B. Excavate subsoil to accommodate building foundations, slabs on grade, paving, Site structures, and construction operations.
- C. Excavate to working elevation for piling Work.
- D. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity as specified in Section 312323 "Fill" and Section 312316.13 "Trenching".

- E. Slope banks with machine to angle of repose or less until shored.
- F. Do not interfere with 45-degree bearing splay of foundations.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- H. Trim excavation and remove loose matter.
- I. Removal of Deleterious Materials:
 - 1. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume.
 - 2. Remove larger material as specified in Section 312323 "Fill".
 - 3. Remove excess and unsuitable material from Site.
- J. Notify Architect/Engineer of unexpected subsurface conditions.
- K. Correct over-excavated areas with structural fill as specified in Section 312323 "Fill" as directed by Architect/Engineer.
 - 1. Stockpile subsoil in area designated on Site to depth not exceeding 8 feet and protect from erosion.
- L. Repair or replace items indicated to remain that have been damaged by excavation.

3.6 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Request visual inspection of bearing surfaces by Architect/Engineer, Representative and inspection agency before installing subsequent Work.
- B. Prepare test and inspection reports.

3.7 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation and maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that may be created by earth operations.

END OF SECTION 312316

SECTION 312316.13 - TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities from 5 feet outside building to utility service.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Fill materials.
4. Trench shoring shields or boxes.
5. Temporary steel plates.
6. Geotextiles.
7. Backfilling and compaction.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete materials.
2. Section 310513 "Soils for Earthwork" for soils for fill.
3. Section 310516 "Aggregates for Earthwork" for aggregates for fill.
4. Section 310519.13 "Geotextiles for Earthwork."
5. Section 312213 "Rough Grading" for topsoil and subsoil removal from Site surface.
6. Section 312316 "Excavation" for general building excavation.
7. Section 312323 "Fill" for general backfilling.
8. Section 333100 "Sanitary Sewerage Piping" for sanitary sewer piping and bedding from building to utility service.

1.2 DEFINITIONS

- A. Excavator: Any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company, or state or local government body or public agency which performs excavation operations, including the excavation of trenches.
- B. Trench: An excavation which is narrow in relation to its length and deeper than it is wide, made more than three feet below grade, with width no greater than 15 feet as measured from the bottom.
- C. Trench Shoring: The methods and equipment, including shores and props, used to brace the walls of a trench during excavation work and to prevent the trench walls from collapsing into the trench. Also referred to as trench bracing or trench lining.
- D. Utility: Any buried pipe, duct, conduit, or cable.

1.3 PREINSTALLATION MEETINGS

- A. A. Preinstallation Conference: Conduct conference at Project Site.

1.4 SUBMITTALS

- A. Excavation Protection Plan: Describe sheeting, trench shoring shields, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan. If necessary, prepare design calculations and drawings, stamped and signed by a professional engineer registered in the State of Louisiana, who is experienced in designing excavation support systems.
- B. Product Data: Submit data for sheeting, shoring, trench shoring shields, and geotextile fabric indicating fabric and construction.
- C. Source Quality-Control Reports: For subsoil.
- D. Material Test Reports: For each fill material, by a qualified testing agency.
- E. Field Quality-Control Reports: For fill material placement and compaction.

1.5 QUALITY ASSURANCE

- A. Installers Qualifications: Company specializing in performing Work of this Section with minimum three years' experience.
- B. Licensed Professionals Qualifications: Professional engineer experienced in design of specified Work and licensed in State of Louisiana.
- C. Furnish each aggregate material from single source throughout Work.

1.6 PROTECTION OF UNDERGROUND FACILITIES

- A. The Contractor will conduct an investigation to assure that no damage to existing structures, drainage lines, utilities, or conduits will occur.
- B. The Contractor is required to use caution when encountering active or abandoned utility structures to avoid possibly disturbing or damaging asbestos-containing materials (ACM), which may be present. The Contractor will notify the Architect/Engineer of any suspected ACM encountered in Site utility structures and is responsible for arranging testing of the suspect material by polarized light microscopy (PLM) or other approved method before proceeding with any Work that would disturb the structures.
- C. While the excavation is open, protect, support, or remove underground installations as necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

2.2 FILL MATERIALS

- A. Subsoil Fill: Type S1 as specified in Section 310513 "Soils for Earthwork".
- B. Structural Fill: Type S1 as specified in Section 310513 "Soils for Earthwork".
- C. Granular Fill: Type A5, A6, and A7 as specified in Section 310516 "Aggregates for Earthwork".
- D. Concrete: Flowable fill.

2.3 TRENCH SHORING SHIELDS OR BOXES

- A. Provide professional engineer-certified,, single-wall or double-wall trench shields or boxes with the following characteristics:
 - 1. Modular shoring system.
 - 2. Foam-filled option.
 - 3. Lifting lugs standard.
 - 4. Hardwood filled top boards.
 - 5. Stackable.
 - 6. Reinforced cutting edges.
 - 7. Minimum five standard lengths.
 - 8. Dual purpose end posts accept either panels, screw jacks, or spreaders allowing two-, three-, or four-sided shields using the same components.
- B. Manufacturers:
 - 1. American Shoring Inc.
 - 2. ESC Trench Shoring.
 - 3. PRO-TEC Equipment.
 - 4. Trench Shoring Company.

2.4 TEMPORARY STEEL PLATES

- A. Place temporary steel plates over all saw cuts and trenches in roadway areas that will be subjected to traffic during installations to allow for the passage of vehicular traffic.
- B. Design the steel plates to size and thickness capable of supporting HS-20 loading, but not less than one inch thick.
- C. Submit design criteria and calculations that determine the sizes to be used to Architect/Engineer for approval.
- D. Completely cover the opening with plates and overlap a minimum of 24 inches on all sides.
 - 1. Secure the plates to pavement with spikes or similar devices to prevent any movement of the plates.
 - 2. Place bituminous concrete around the edges of the steel plating to provide a smooth transition on and off the plates for vehicles.
 - 3. When the steel plating is removed, also remove the temporary bituminous concrete.

2.5 GEOTEXTILES

- A. Filtration Fabric: Provide to line pipe trenches according to Section 310519.13 "Geotextiles for Earthwork," Nonwoven Geotextile Materials.
- B. Erosion Control: Provide erosion control and subsurface drainage geotextile as required for trench Work according to Section 310519.13 "Geotextiles for Earthwork," Woven Geotextiles for Erosion Control.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with trench excavation only after unsatisfactory conditions have been corrected.

3.2 LINES AND GRADES

- A. Lay pipes and conduit to lines and grades as indicated on Drawings.
 - 1. Architect/Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with qualified operator to establish lines and grades.
- C. Maintain grade alignment of pipe and conduit using string line parallel with grade line and vertically above centerline of pipe or conduit.
 - 1. Establish string line on level batter boards at intervals of not more than 25 feet.
 - 2. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
 - 3. Set three adjacent batter boards before laying pipe to verify grades and line.
 - 4. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe or conduit route.
 - 5. Do not locate pipe or conduit using side lines for line or grade.

3.3 PREPARATION

- A. Call local utility line information service at 811 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
 - 2. If utilities are to remain in place, provide adequate means of protecting during trench excavation operations.

3. Should uncharted or incorrectly charted piping or other utilities be encountered during trench excavation, consult Architect/Engineer immediately for directions. Cooperate with Architect/Engineer and public utility service companies as required to keep their respective services and facilities in operation. Repair damaged utilities to the satisfaction of Architect/Engineer, Owner and utility company.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above- and below-grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.4 TRENCHING

- A. Excavate subsoil required for utilities to utility service.
- B. Perform excavation within 24 inches of existing utility service according to utility's requirements.
- C. Do not advance open trench more than 50 feet ahead of installed pipe or conduit.
- D. Cut trenches to width as indicated on Drawings and sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work according to OSHA 29 CFR 1926.650.
- E. Excavate bottom of trenches maximum 2 feet wider than outside diameter of utility or 3 feet wider than outside diameter of stormwater conduit.
- F. Excavate trenches to depth as indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe conduit utilities.
- G. Do not interfere with 45-degree bearing splay of trench or foundations.
- H. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe or conduit. When side walls cannot be sloped, provide sheeting and trench shoring shields to protect excavation as specified in this Section.
- I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer until suitable material is encountered.
- J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type S1 and compact to density equal to or greater than requirements for subsequent backfill material.
- K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

- L. Correct over-excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.
- A. Remove from Site excess topsoil not intended for reuse as directed by Architect/Engineer.
- B. Stockpile subsoil or excavated material in area designated on Site to depth not exceeding 8 feet and protect from erosion.
- C. Locate a stairway, ladder, ramp, or other safe means of egress in trench excavations that are 4 feet or more in depth to require no more than 25 feet of lateral travel for personnel.

3.5 SHEETING, SHORING, AND TRENCH SHORING SHIELDS

- A. Utilize sheeting, shoring, and trench shoring shields and brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.
- B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, trench shoring shields, or other protection to maintain stability of excavation.
- C. When sheeting is used, drive it ahead of the excavation operations to avoid the loss of material from behind the sheeting. Fill voids that occur outside of the sheeting with gravel borrow, thoroughly compacted.
- D. Assemble and place trench shoring shields according to manufacturer's written instructions.
- E. Design sheeting and shoring to be removed at completion of excavation Work.
- F. Repair damage caused by failure of the sheeting, shoring, trench shoring shields, or bracing and for settlement of filled excavations or adjacent soil.
- G. Repair damage to new and existing Work from settlement, water pressure, earth pressure, or other causes resulting from inadequate sheeting, shoring, trench shoring shields, or bracing.

3.6 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Place fill material in continuous layers and compact.
- D. Employ placement method that does not disturb or damage foundation perimeter drainage, and utilities in trench.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Do not leave more than 50 feet of trench open at end of working day.

- G. Protect open trench to prevent danger to the public.

3.7 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.8 FIELD QUALITY CONTROL

- A. Perform laboratory material tests according to ASTM D698.
- B. Perform in place compaction tests according to the following:
 - 1. Density Tests: ASTM D1556, or ASTM D6938.
 - 2. Moisture Tests: ASTM D6938.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- D. Frequency of Tests: As directed.

3.9 PROTECTION OF FINISHED WORK

- A. Reshape and recompact fills subjected to vehicular traffic during construction.

END OF SECTION 312316.13

SECTION 312323 - FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fill materials.
2. Geotextiles.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for soils for fill.
2. Section 310516 "Aggregates for Earthwork" for aggregates for fill.
3. Section 310519.13 "Geotextiles for Earthwork" for geotextile fabric for placement over fill.
4. Section 312213 "Rough Grading" for Site filling.
5. Section 312316 "Excavation" for backfilling of building foundations and utilities within building perimeter.
6. Section 312316.13 "Trenching" for backfilling of utility trenches.
7. Section 313716.13 "Rubble-Stone Riprap" for riprap and rock lining placed loose for soil stabilization and slope protection.
8. Section 313716.19 "Sacked Sand-Cement Riprap" for riprap and rock lining used for soil stabilization and slope protection.
9. Section 331416 "Site Water Utility Distribution Piping" for pipe materials, fittings, valves, meters, and backflow preventers.
10. Section 333100 "Sanitary Sewerage Piping" for pipe materials and accessories normally encountered with gravity sanitary building piping.
11. Section 334200 "Stormwater Conveyance" for drainage facilities to collect and provide for flow of stormwater.

1.2 SUBMITTALS

A. Product Data: For fill materials and geotextiles.

B. Samples:

1. Submit, in airtight containers, one 10-lb. sample of each type of fill to testing laboratory.
2. Submit two samples, full width by long, for each type and weight of geotextile used on Project, illustrating thickness, and seaming method.

C. Source Quality-Control Reports: For subsoil.

D. Material Test Reports: For each fill material, by a qualified testing agency.

E. Field Quality-Control Reports: For fill material placement and compaction.

1.3 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 FILL MATERIALS

- A. Subsoil Fill: Type S1, as specified in Section 310513 "Soils for Earthwork".
- B. Structural Fill: Type S1, as specified in Section 310513 "Soils for Earthwork".
- C. Granular Fill: Type A5, A6 and A7, as specified in Section 310516 "Aggregates for Earthwork".

2.3 GEOTEXTILES

- A. Geotextile Fabric: Provide erosion control, subsurface drainage, and soil reinforcement geotextile as required for fill Work according to Section 310519.13 "Geotextiles for Earthwork."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the Work.
- B. Verify that subdrainage, damp proofing, and waterproofing installations have been inspected.
- C. Verify that underground tanks are anchored to their own foundations to avoid flotation after backfilling.
- D. Verify structural integrity of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

- A. Call local utility line information service at 811 not less than three working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Protect utilities indicated to remain free from damage.
- D. Compact subgrade to specified density requirements for subsequent backfill materials.
- E. Soft Subgrade:
 1. Cut out soft areas of subgrade not capable of compaction in place.
 2. Backfill with structural or granular fill and compact to density equal to or greater than specified requirements for subsequent fill material.
- F. If directed, scarify subgrade surface to depth of 8 inches.
- G. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations.
- B. Systematically backfill to allow maximum time for natural settlement.
- C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces, and do not backfill with frozen materials.
- D. Maximum Compacted Depths:
 1. Place material in continuous layers to following depths:
 - a. Subsoil Fill: Maximum 8 inches compacted depth.
 - b. Structural Fill: Maximum 6 inches compacted depth.
 - c. Granular Fill: Maximum 6 inches compacted depth.
- E. Use placement method that does not disturb or damage foundation perimeter drainage, or utilities in trench.
- F. Maintain optimum moisture content of fill materials to attain required compaction density.
- G. Structures:
 1. Backfill against supported foundation walls.
 2. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
 3. Slope grade away from building minimum 5 percent slope for minimum distance of 10 feet.
- H. Make gradual grade changes and blend slope into level areas.

- I. Install Work according to Work according to the LA DOTD standards.

3.4 TOLERANCES

- A. Top Surface of Backfilling within Building Areas: Plus or minus 1 inch from required elevations.
- B. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Inspections: Request visual inspection of bearing surfaces by Architect, Engineer or Representative before installing subsequent Work.
- B. Testing:
 - 1. Laboratory Material Testing: Comply with ASTM D-698 Standard Proctor.
 - 2. In-Place Compaction Density and Moisture Testing: Comply with ASTM D-698 Standard Proctor.
 - 3. If tests indicate that Work does not meet specified requirements, remove Work, replace, compact, and retest.
 - 4. Testing Frequency: To be performed at a frequency of not less than one test per 2,500 and 5,000 square feet of surface area per lift in the building and pavement areas, respectively, with a minimum of three tests per lift.
 - 5. Proof-roll compacted fill surfaces under slabs on grade, pavers, and paving.

3.6 PROTECTION

- A. Reshape and recompact fills subjected to vehicular traffic during construction.

END OF SECTION 312323

SECTION 312323.33 - FLOWABLE FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Flowable fill.
2. Mixes.

B. Related Requirements:

1. Section 312316 "Excavation" for general building excavation.
2. Section 312316.13 "Trenching" for soil and aggregate backfill for utility trenches.
3. Section 312323 "Fill" for soil and aggregate backfill for structures.
4. Section 331413 "Public Water Utility Distribution Piping" for public water distribution systems.
5. Section 333100 "Sanitary Sewerage Piping" for sanitary sewer piping and bedding from building to utility service.
6. Section 334200 "Stormwater Conveyance" for gravity storm drain piping from building to municipal utility or other discharge system.

1.2 DEFINITIONS

- A. Excavatable Flowable Fill: A type of lean cement concrete fill used where future excavation may be required, such as utility trenches, bridge abutments, and culverts.
- B. Non-excavatable Flowable Fill: A type of lean cement concrete fill used where future excavation is not anticipated, such as below structure foundations and filling abandoned utilities.
- C. Utility: A buried pipe, duct, conduit, manhole, tank, or cable.

1.3 SUBMITTALS

- A. Product Data: For flowable fill and mixes.
- B. Submit manufacturer's specifications, catalog cuts, and other engineering data needed to demonstrate compliance with specified requirements.
 1. Submit mix designs, test reports, and complete descriptions of equipment, methods, and schedules of placement, showing compliance with specified properties. Include source, brand, and type of cement, and admixtures.
 - a. Furnish certification that flowable fill material fully conforms to specification requirements.

- b. Include, at minimum, the following information in test report for proposed flowable fill mix:
 - 1) Total gallons of water per cubic yard.
 - 2) Brand, type, composition, and quantity of cement.
 - 3) Brand, type, ASTM designation, lot number, and quantity of foaming agent.
 - 4) Cast wet density.
 - 5) Oven dry density.
 - 6) Water absorption, percent of volume.
 - 7) Brand, type, ASTM designation, active chemical ingredients, and quantity of each admixture, when used.
 - 8) Foam volume for LCCF.
 - 9) Compressive strength based on 7-day and 28-day compression tests.
 - 10) Water-cement ratio.
 - 11) Freeze-thaw resistance.
 - 12) Coefficient of permeability at confining stresses of 2 psi and 8 psi.
 - 13) Loss of air during pumping and air content before and after pumping.
 - 14) Density of preformed foam.
 - 15) Foam generation and other equipment used and foam discharge rate.
 - 16) Mixing times and temperature of water used.
- 2. Furnish certification by foaming agent manufacturer that proposed material, equipment, application procedures, installers, and setup are acceptable before production is initiated.
- 3. Submit calibration records and maintenance reports on all mixing equipment.
- 4. Submit procedures to place flowable fill below standing water and during extremes in temperatures.
- 5. Submit as-built drawing showing spot elevations and one-foot contours of excavated subgrade and bottom of flowable fill.
- 6. Submit daily field reports and all test results of flowable fill.

1.4 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Minimum Conditions: Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 FLOWABLE FILL

- A. Provide excavatable type and non-excavatable type consisting of the following material and admixture components in accordance with LA DOTD specifications and requirements.

2.3 SOURCE QUALITY CONTROL

- A. Testing and Analysis:
 - 1. Subsoil or Topsoil Materials: Perform according to LA DOTD.
 - 2. If tests indicate materials do not meet specified requirements, change material and retest.
- B. Prepare delivery tickets containing the following information:
 - 1. Project designation.
 - 2. Date.
 - 3. Time.
 - 4. Class and quantity of flowable fill.
 - 5. Actual batch proportions.
 - 6. Free moisture content of aggregate.
 - 7. Quantity of water withheld.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify excavation specified in Section 312316 "Excavation" trenching or specified in Section 312316.13 "Trenching" is complete.
- C. Verify utility installation is complete and tested before placing flowable fill.
- D. Verify excavation is dry.

3.2 PREPARATION

- A. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.

- B. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.
- C. Protect utilities and foundation drains to prevent intrusion of flowable fill.

3.3 INSTALLATION OF FILL, BEDDING, AND BACKFILL

- A. Architect/Engineer approval required for the condition of subgrade and method of placement.
- B. Remove all debris and foreign matter from the excavation before depositing flowable fill.
- C. Place flowable fill by chute, pumping or other methods approved by Architect/Engineer.
 - 1. Do not place flowable fill through flowing water.
- D. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.
- E. Place flowable fill evenly on both sides of utilities to maintain alignment.
- F. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

3.4 INSTALLATION OF FILL FOR ABANDONED UTILITIES

- A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.
- B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.
- C. Place flowable fill using the following methods to ensure there are no voids:
 - 1. Fill pipes and conduits from high end.
 - 2. Fill manholes, tanks, and other structures from grade level access points.
- D. After filling pipes and conduits, seal both ends.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Perform inspection and testing according to ASTM C94/C94M.
 - 1. Take samples for tests for every 150 cu. yd. of flowable fill, or fraction thereof, installed each day.
 - 2. Sample, prepare, and test four compressive strength test cylinders according to ASTM D4832. Test one specimen at three days, one at seven days, and two at 28 days.
 - 3. Measure temperature at point of delivery when samples are prepared.

4. If required, perform in-place penetration (density) tests using handheld penetrometer to measure penetration resistance of hardened flowable fill according to ASTM C403.
 5. Perform tests at locations as directed by Architect/Engineer.
- C. Perform in-place density tests using nuclear test device according to ASTM C1040/C1040M.
1. Perform tests at locations as directed by Architect/Engineer.
- D. Defective Flowable Fill or LCCF: Either fill type failing to meet the following test requirements or fill delivered without the following documentation:
1. Test Requirements:
 - a. Minimum temperature at point of delivery.
 - b. Compressive strength requirements for each type of fill.
 2. Documentation: Duplicate delivery tickets.

3.6 CLEANING

- A. Remove spilled and excess flowable fill from Project Site.
- B. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION 312323.33

SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rock materials.
2. Planting materials.
3. Pipe materials.
4. Stabilized construction entrances.
5. Filter socks.
6. In-water siltation control devices.
7. On-land silt fence.
8. Erosion control blankets.
9. Baled hay.
10. Soil stabilization fabric.
11. Filtration geotextile.
12. Anchoring devices.
13. Accessories.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork."
2. Section 310516 "Aggregates for Earthwork."
3. Section 311000 "Site Clearing."
4. Section 312316 "Excavation."
5. Section 312316.13 "Trenching."
6. Section 312323 "Fill."
7. Section 313716.13 "Rubble-Stone Riprap."
8. Section 329113 "Soil Preparation."
9. Section 329219 "Seeding."
10. Section 334213 "Stormwater Culverts."

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.
- B. Convene minimum one week prior to commencing Work of this Section.

1.3 SUBMITTALS

- A. Product Data: Submit data on on-land silt fence, in-water siltation curtain, filter socks, erosion control blanket, baled hay erosion checks, geotextiles, planting materials, and pipe materials.

- B. Stormwater Pollution Prevention Plan (SWPPP) as specified in QUALITY ASSURANCE Article.
- C. Copy of EPA NPDES Notice of Intent to Discharge submitted to the EPA as specified in QUALITY ASSURANCE Article.
- D. Submit name and applicable experience of soil erosion and sediment control manager according to Section 1.5 F.
- E. Test Reports: Indicate certified tests results for granular backfill.

1.4 QUALITY ASSURANCE

- A. Prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) according to the U.S. Environmental Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) General Permit applicable to this Work, document number EPA 832-R-92-005, dated 1992 or most recent edition.
- B. Prepare and submit the EPA NPDES Notice of Intent to Discharge to the applicable EPA office according to EPA regulations.
- C. Perform Work according to requirements of Section 310513 "Soils for Earthwork," Section 310516 "Aggregates for Earthwork," Section 311000 "Site Clearing," Section 312316 "Excavation," Section 312323 "Fill," Section 329113 "Soil Preparation," Section 329219 "Seeding," Section 313716.13 "Rubble-Stone Riprap," 313716.19 "Sacked Sand-Cement Riprap," Section 334213 "Stormwater Culverts," and Section 334213.13 "Public Pipe Culverts".
- D. A.Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD) and Municipality standards.
- E. Progress Schedule:
 - 1. Clearly outline intended maintenance of traffic, locations where temporary and permanent soil erosion and sediment control measures will be installed, and such other information as required.
 - 2. Provide special consideration to sensitive areas such as wetlands and waterways.
 - 3. Incorporate appropriate staging and seasonal constraints to maximize the effectiveness of the soil erosion and sediment controls.
 - 4. Indicate when Work is restricted in these sensitive areas as outlined in permits issued by regulatory agencies.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 ROCK MATERIALS

- A. Rock: Limestone or Recycled Portland Cement Concrete, LA DOTD 2 lb.; broken stone irregularly shaped rock; solid and nonfriable.

2.3 PLANTING MATERIALS

- A. Seeding and Soil Supplements and Mulch: Furnish according to LA DOTD standards.

2.4 PIPE MATERIALS

- A. Pipe: Furnish according to LA DOTD standards.

2.5 STABILIZED CONSTRUCTION ENTRANCES

- A. Stone Size: LA DOTD, 2 pound.
- B. Length: As effective, but not less than 50 feet.
- C. Thickness: Not less than 8 inches.
- D. Width: Not less than full width of all points on ingress or egress, minimum 25 feet wide.
- E. Washing: When necessary, clean wheels to remove sediment prior to entrance onto public right-of-way. When washing is required, provide an area stabilized with crushed stone that drains into an approved sediment trap or sediment basin. Prevent all sediment from entering any storm drain, ditch, or watercourse by using sandbags, gravel boards, or other approved methods.
- F. Maintenance: Maintain entrance in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair or cleanout of any measures used to trap sediment. All sediment spoiled, dropped, washed, or tracked onto public rights-of-way must be removed immediately.

2.6 FILTER SOCKS

- A. Provide filter socks consisting of a three-dimensional matrix of certified, composted organic material or other organic matter to create a filter medium. Fill the tubular mesh sock with organic filter material of wood chips or mulch that has been screened to remove fines, crushed stone, or gravel. Use crushed stone or gravel when the sock will be used on paved areas where the sock cannot be staked in place. Fill the sock with organic material by blowing the material into the tube with a special pneumatic blower truck or similar device. Hand filling with organic material is not an acceptable means to fill the tube as the material cannot be compacted in the sock.
- B. Performance and Design Criteria:
 - 1. Mesh Material Type: Multi-filament polypropylene (MFPP) photodegradable.
 - 2. Uses: Standard sediment control applications.

3. Mesh Opening Size: 1/8 inch.
4. Available Diameters: As specified or required.
5. Functional Longevity/Project Duration: Up to five years.
6. Tensile Strength: MD - 670 lb., TD - 423 lb.
7. Locally sourced filter media.
8. Mesh Color: Green or tan.

2.7 IN-WATER SILTATION CONTROL DEVICES

- A. In-Water Siltation Curtain: Provide Type 2, DOT floating silt and turbidity curtain.
- B. Performance and Design Criteria:
 1. Fabric: 22 oz./sq. yd. PVC-coated polyester in international orange or high visibility yellow.
 2. Flotation: 8 inches to 12 inches diameter (depending on skirt depth) expanded polystyrene (EPS) foam contained in individually sealed float pockets.
 3. Top Tension: 5/16-inch galvanized steel cable; 9,800 lb. breaking strength; contained in a polyethylene tub.
 4. Bottom Tension and Ballast: 5/16-inch galvanized steel chain; 7,600 lb. breaking strength; 0.93 lb./ft. weight.
 5. End Connectors: High-tensile-strength aluminum universal connector at float and top tension cable; 3/8-inch stainless steel locking pins; lacing grommets on reinforced fabric on lower skirt; chain ends shackled section to section; tool-free connections.
 6. Section Length: 50 feet and 100 feet standard.
 7. Skirt Depth: To 50 feet; can be tapered to conform to bottom profile.
 8. Furling Lines: Available on request.
 9. Available Accessories: Anchor systems, ropes, marker buoys, solar-powered lights, repair kits.

2.8 ON-LAND SILT FENCE

- A. Provide on-land silt fence consisting of a woven fabric comprised of high-tenacity polypropylene yarns and a plastic net backing, square hardwood posts, and connection hardware or aluminum wire.
- B. Performance and Design Criteria:
 1. Grab Tensile Strength (Machine Direction): ASTM D4632 - 124 lb.
 2. Grab Tensile Strength (Cross-Machine Direction): ASTM D4632 - 124 lb.
 3. Grab Tensile Elongation: ASTM D4632 - 15 percent.
 4. Mullen Burst Strength: ASTM D3786 - 300 psi.
 5. Trapezoid Tear Strength: ASTM D4533 - 65 lb.
 6. Permittivity: ASTM D4491 - 0.10 sec⁻¹.
 7. Water Flow Rate: ASTM D4491 - 10 gpm/sq. ft.
 8. Ultraviolet Stability: ASTM D4355 - 70 percent.
 9. Length: 100 feet.
 10. Width: 3 feet.
 11. Post Length: 4 feet.

12. Post Spacing: 8.3 feet.

- C. Prefabricated commercial silt fence may be substituted for built-in-field fence. Provide prefabricated "Envirofence" as manufactured by Mirafi, or Architect/Engineer approved equivalent.

2.9 EROSION CONTROL BLANKETS

- A. Erosion Control Blanket: 100 percent agricultural straw fiber matrix, 0.5 lb./sq. yd., stitch bonded with degradable thread between two photodegradable polypropylene nettings.
1. Basis-of-Design Product: EroNet Model S150BN Double Net Short-Term Blanket (12 months) by North American Green (Evansville, IN), or products and manufacturers listed below:
- a. Curex II, DeWitt.
 - b. Permier Double Side, American Excelsior Company.
 - c. Excel SS-2AN, Western Excelsior Company.
 - d. ETRS-2-BN, MKB Company, LLC.
 - e. Lanlok ECB S2-ENS2, Propex.
- B. Securement: Staples used to anchor erosion control blankets should be U-shaped, 11-gage or heavier steel wire, having a span width of 1 inch and a length of 6 inches or more from top to bottom after bending.

2.10 BALED HAY

- A. Provide baled hay erosion checks consisting of new, firm, wire-bound, livestock feed-grade hay bales, employed at locations detailed on the Drawings or as required to perform erosion control. Provide No. 2 pine or hem fir stakes measuring a minimum of 2 inches by 2 inches wide by 48 inches long for staking and securement of hay bales.

2.11 SOIL STABILIZATION FABRIC

- A. Provide soil stabilization fabric consisting of durable woven fabric, resistant to tearing, rot, mildew, and soil chemicals, composed wholly of polypropylene or a combination of polypropylene and other continuous-filament fibers. Provide pore openings permitting drainage.
- B. Performance and Design Criteria:
- 1. Weight: ASTM D5262 - 4 oz./sq. yd.
 - 2. Grab Tensile Strength: ASTM D4632 - 200 lb.
 - 3. Grab Tensile Elongation: ASTM D4632 - 15 percent.
 - 4. Mullen Burst Strength: ASTM D3786 - 400 psi.
 - 5. CBR Puncture: ASTM D6241 - 700 lb.
 - 6. Trapezoid Tear Strength: ASTM D4533 - 75 lb.
 - 7. Apparent Opening Size: ASTM D4751 - 40 U.S. sieve.
 - 8. Permittivity: ASTM D4491 - 0.05 sec⁻¹.

9. Water Flow Rate: ASTM D4491 - 5 gpm/sq. ft.
10. Ultraviolet Stability: ASTM D4355 - 70 percent.
11. Length: As specified or required.
12. Width: As specified or required.

2.12 FILTRATION GEOTEXTILE

- A. Provide woven filtration geotextile comprised of high-tenacity, monofilament, 100 percent polypropylene yarns, which resists ultraviolet and biological deterioration, rotting, and naturally encountered basics and acids. Place filtration geotextile on subgrade below riprap stone or as indicated.
- B. Performance and Design Criteria:
 1. Grab Tensile Strength: ASTM D4632 - 425 by 350 lb.
 2. Grab Tensile Elongation: ASTM D4632 - 21 percent.
 3. Wide Width Tensile Strength: ASTM D4595 - 3,240 by 2,700 lb./ft.
 4. CBR Puncture: ASTM D6241 - 1,340 lb.
 5. Trapezoid Tear Strength: ASTM D4533 - 145 by 125 lb.
 6. Apparent Opening Size: ASTM D4751 - 40 U.S. sieve.
 7. Permittivity: ASTM D4491 - 0.96 sec^{-1} .
 8. Permeability: ASTM D4491 - 0.046 cm/s.
 9. Water Flow Rate: ASTM D4491 - 70 gpm/sq. ft.
 10. Percent Open Area: CW-02215 - 6 percent.
 11. Ultraviolet Stability: ASTM D4355 - 90 percent.
 12. Length: 300 feet.
 13. Width: 12.5 feet.

2.13 ANCHORING DEVICES

- A. Staples: Must be No. 8 gage steel wire, bent U-shapes with throat width equal to 1 to 2 inches, and effective driving depth of 6 inches or as suggested by the manufacturer.
- B. Sandbags: Must be of proper size to temporarily stabilize fabric; number and weight sufficient to withstand wind speeds of 50 mph.

2.14 SOURCE QUALITY CONTROL (AND TESTS)

- A. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Verify compacted subgrade, granular base, or stabilized soil is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other Work are correct.

3.2 PROJECT REQUIREMENTS

- A. The Contractor is responsible for the timely installation and maintenance of all sedimentation control and dewatering devices necessary to prevent the movement of sediment from the construction Site to off-site areas or into wetlands or other drainage systems. Measures listed here, in addition to those shown on the Drawings, necessary to prevent the movement of sediment off-site are required to be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered.

3.3 INSTALLATION OF DIVERSION CHANNELS

- A. Windrow excavated material on low side of channel.
- B. Compact to 95 percent maximum density.
- C. On entire channel area, apply soil supplements and sow seed as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
- D. Mulch seeded areas with hay as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
- E. Install Work according to LA DOTD standards.

3.4 INSTALLATION OF ROCK ENERGY DISSIPATOR

- A. Excavate to indicated depth of rock lining or nominal placement thickness. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
 - 1. Nominal Placement Thickness per National Crushed Stone Association (NCSA), Class:
 - a. R8: 48 inches.
 - b. R7: 36 inches.
 - c. R6: 30 inches.
 - d. R5: 24 inches.
 - e. R4: 18 inches.
 - f. R3: 12 inches.
- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than four weeks.

- C. Carefully place rock on filtration geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.5 INSTALLATION OF ROCK BASIN

- A. Construct generally according to rock energy dissipator requirements to indicated shape and depth. Rock courses may be placed in several operations, but minimum depth of initial course must be 3 feet or greater.

3.6 INSTALLATION OF ROCK BARRIER

- A. Determine length required for ditch or depression slope and excavate, compact, and foundation area to firm, even surface.
- B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height, and slope.
- C. Construct coarse-aggregate filter blanket against upstream face of rock barrier to the indicated thickness according to LA DOTD standards.

3.7 INSTALLATION OF SEDIMENTATION POND

- A. Clear and grub storage area and embankment foundation site as specified in Section 311000 "Site Clearing."
- B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.
- C. Install pipe spillway, with anti-seep collar attached, at location indicated.
- D. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.
- E. Construct rock basin at outlet end of pipe as specified in this Section. Place embankment material as specified in Section 312323 "Fill." When required, obtain borrow excavation for formation of embankment as specified in Section 312323 "Fill."
- F. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
- G. Install Work according to LA DOTD standards.

3.8 INSTALLATION OF SEDIMENT TRAPS

- A. Clear Site as specified in Section 311000 "Site Clearing."

- B. Construct trap by excavating and forming embankments as specified in Section 312316 "Excavation" and Section 312323 "Fill."
- C. Place coarse aggregate or rock at outlet as indicated on Drawings.
- D. Place geotextile fabric as specified for rock energy dissipator.
- E. When required, obtain borrow excavation for formation of embankment as specified in Section 312316 "Excavation."
- F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding."
- G. Mulch seeded areas with hay as specified in Section 329113 "Soil Preparation" and Section 329219 "Seeding" and install Work according to LA DOTD standards.

3.9 INSTALLATION OF CONSTRUCTION ENTRANCE

- A. Construct entrance with minimum of 6 inches of coarse aggregate at all points of ingress and egress.
- B. Width: Minimum 20 feet, increased as needed for typical construction vehicles.
- C. Minimum Length: 50 feet where soils are coarse grained. 100 feet where soils are fine grained or clay/silt.
- D. Install filter fabric below aggregate.
- E. Maintain entrance throughout construction, adding more aggregate or increasing length as needed.

3.10 INSTALLATION OF SILT FENCE

- A. Position sediment fences as indicated on the Drawings and to prevent off-site movement of sediment produced by construction activities as directed by Architect/Engineer or Representative. Provide areas beyond limits of silt fence undisturbed or stabilized.
- B. Dig trench approximately 6 inches wide and 6 inches deep along proposed fence lines.
- C. Drive stakes maximum 10 feet on center at back edge of trenches. Drive stakes minimum 2 feet into ground.
- D. Hang filter fabric on posts carrying to bottom of trench with about 4 inches of fabric laid across bottom of trench. Stretch fabric taut along fence length and maintain secure both ways.
- E. Backfill trench with excavated material and tamp.
- F. Install prefabricated silt fence according to manufacturer's instructions.

3.11 INSTALLATION OF TURBIDITY CURTAIN

- A. Install turbidity curtain parallel to bank, extending beyond lateral limits of construction.
- B. Install weights at 10-foot intervals, floats at 5-foot intervals.
- C. Inspect turbidity curtain daily and repair or replace worn or torn areas as needed.
- D. At end of construction, remove accumulated sediment by hand before removing the turbidity curtain.

3.12 INSTALLATION OF FILTER SOCKS

- A. Position filter socks as indicated and as necessary to prevent off-site movement of sediment produced by construction activities as directed by the Architect/Engineer or Representative.
 - 1. Install erosion control measures around all existing catch basins within the Project limits and in the adjacent affected areas, or as determined by the Architect/Engineer or Representative in the field.
- B. Install stakes through the middle of the sediment control on minimum 10-foot centers. Depth of staking must be 12 inches for sand or silt and 8 inches for clay soils.
- C. Install filter socks, as indicated, and stake as required.
- D. Furnish, place, and maintain filter socks as specified and as shown. Remove upon completion of all Work.

3.13 INSTALLATION OF BALED HAY

- A. Install baled hay in location as shown and as directed by the Architect/Engineer or Representative.
- B. Install by anchoring bales butted together to existing ground with at least two stakes per bale. Replace deteriorated bales. Remove and dispose of bales following the successful growth of vegetation in the areas disturbed by construction. The removal of bales will be subject to approval of Architect/Engineer or Representative. On embankment areas and on flat areas adjacent to wetland areas, install the bales continuously between the construction Site and the wetland area as indicated.
- C. Install baled hay around all catch basins to be protected as identified.

3.14 INSTALLATION OF ANTI-SEEP COLLAR

- A. Apply tar or mastic to bottom half of collar and lay pipe on collar.
- B. Apply mastic to top half of collar and set in place, lining up colored stripes.
- C. Bolt the two halves together and install metal bands. Tighten bolts and bands.

- D. Apply mastic as needed to provide a positive seal.
- E. Backfill and hand tamp.

3.15 SITE STABILIZATION

- A. Incorporate erosion control devices indicated into the Project at the earliest practicable time.
- B. Construct, stabilize, and activate erosion controls before Site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights must not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas that are not at finished grade and which will be disturbed within one year according to Section 329113 "Soil Preparation" and Section 329219 "Seeding" at 75 percent of permanent application rate with no topsoil.
 - 3. Stabilize disturbed areas that either are at finished grade or will not be disturbed within one year according to Section 329113 "Soil Preparation" and Section 329219 "Seeding" permanent seeding specifications.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.16 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- C. Frequency of Compaction Testing: One for each lift.
- D. Prepare test and inspection reports.

3.17 CLEANING

- A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- B. Do not damage structure or device during cleaning operations.
- C. Do not permit sediment to erode into construction or Site areas or natural waterways.
- D. Clean channels when depth of sediment reaches approximately one-half channel depth.

END OF SECTION 312500

Section 31 31 16

Termite Control

Specifications

31 31 16-1

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
 - A. Soil treatment for termite control below grade and foundation perimeter at new buildings.
- 1.02 RELATED SECTIONS
 - A. Section 31 06 20 - Schedules for Earth Moving
- 1.03 REFERENCES
 - A. EPA - Environmental Protection Agency - Federal Insecticide, Fungicide and Rodenticide Act.
- 1.04 SUBMITTALS FOR REVIEW
 - A. Section 01 30 00 - Submittals: Procedures for submittals.
 - B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
- 1.05 SUBMITTALS FOR INFORMATION
 - A. Section 01 30 00 - Submittals: Procedures for submittals.
 - B. Test Reports: Indicate regulatory agency approval reports when required.
 - C. Manufacturer's Application Instructions: Indicate caution requirements.
 - D. Manufacturer's Certificate: Certify toxicants meet or exceed specified requirements.
- 1.06 REGULATORY REQUIREMENTS
 - A. Conform to applicable code for requirements for application, application licensing, authority to use toxicant chemicals in accordance with EPA.
 - B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.
- 1.07 SEQUENCING
 - A. Apply toxicant 12 hours prior to installation of vapor barrier under slabs-on-grade.
- 1.08 WARRANTY
 - A. Written in the form of an insurance policy in the amount of 10% of the project construction cost or \$100,000.00, whichever is less, for damages to building and contents. Rating for insurance company shall be A-, IV (4).
 - B. Shall be secured with a bond by a Louisiana-licensed Surety.
 - C. If evidence of termites occurs within warranty period, areas shall be retreated at no cost to the Owner.
 - D. Include optional renewal policy on annual basis after fifth year; fee shall be equitable and agreed upon by applicator and the Owner.
 - E. Test Reports: Indicate regulatory agency approval reports when required.
 - F. 5-years non-prorated from Date of Substantial Completion (not the application date) against infestation and/or termite damage.
 - G. Include coverage for damage and repairs to building and building contents caused by termites. If evidence of termites occurs within warranty period, areas shall be retreated at no cost to the Owner. Repair all damage to building and contents caused by termites. Re-treat where required.
 - H. Inspect and report annually to Owner in writing.

PART 2 - PRODUCTS

- 2.01 MATERIALS
 - A. Manufacturers:
 - 1. Dow AgroSciences
 - 2. FMC Corporation
 - 3. American Cyanamid Corp.
 - 4. Substitutions: In accordance with Section 01 63 00
 - B. The chemical to be used shall be one which is accepted by the U.S. Department of Agriculture, Division of Insecticides and Fungicides as having prolonged effectiveness as a toxicant against subterranean termites. In no event shall the anticipated effective duration of the termite chemical be for less than two years. The chemical shall be applied at the dosage rate recommended by the manufacturer and the U.S. Department of Agriculture.

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Termite Control

Specifications

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- C. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.
- D. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

- A. Manufacturer's pre-mixes only; no job site mixing of chemicals allowed.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Notify Architect at least 48 hours prior to application.
- B. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.
- C. Verify final grading is complete.

3.02 APPLICATION

- A. Spray apply toxicant in accordance with manufacturer's instructions.
- B. Apply toxicant 12 hours min. prior to installation of vapor barrier under slabs-on-grade
- C. Apply toxicant at locations indicated in Schedule at end of Section.
- D. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- E. Re-treat disturbed treated soil with same toxicant as original treatment.
- F. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Do not permit soil grading over treated work.
- C. Post signs in areas of application warning that poison has been applied; leave signs in place for minimum 2 weeks following application

3.04 SCHEDULES

- A. Locations:
 - 1. Under slabs-on-grade at building (s).
 - 2. Soil within 10 ft. of building perimeter. Apply treatment to building perimeter after final grading is complete.
 - 3. All other areas as required to obtain Contractor's and/or manufacturer's warranty required by this Section.

END OF SECTION

SECTION 313716.13 - RUBBLE-STONE RIPRAP

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Riprap rock.
2. Filter, bedding, stone, and spalls.
3. Filtration geotextile.

B. Related Requirements:

1. Section 310519.13 "Geotextiles for Earthwork" for reinforcement barrier.
2. Section 312213 "Rough Grading" for removal of topsoil and filling associated with contouring of Site.
3. Section 312316 "Excavation" for excavating for riprap.
4. Section 312316.13 "Trenching" for trenching and backfilling for Site utilities.
5. Section 312323 "Fill" for backfilling as required at building perimeter and Site structures.
6. Section 312500 "Erosion and Sedimentation Controls" for filtration fabric placed below riprap.
7. Section 334213 "Stormwater Culverts" for excavating, bedding, and backfilling requirements for stormwater culverts and accessories.
8. Section 334213.13 "Public Pipe Culverts" for excavating, bedding, and backfilling requirements for public pipe culverts and accessories.

1.2 DEFINITIONS

- A. Filter: A transitional layer of gravel, small stone, or fabric placed between underlying soil and riprap stone to prevent migration of fine soil particles through voids in riprap. It also distributes the weight of the armor units to provide more uniform settlement and permits relief of hydrostatic pressures within the soils.
- B. NCHRP: National Cooperative Highway Research Program.
- C. NCSA: National Crushed Stone Association.
- D. Riprap: A relatively thin layer of large, durable, approximately equidimensional rock fragments or blocks placed on bedding to dissipate water energy and protect a slope, channel bank, or shore from erosion caused by runoff, currents, waves, or ice.
- E. Rubble Riprap: A type of riprap that includes rock spoils, broken concrete, and steel furnace slag. Its quality is dependent on its shape, specific weight, gradation, and durability (resistance to weathering).

1.3 COORDINATION

- A. Coordinate Work of this Section with rough grading, excavating and utilities.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.
- B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Riprap rock.
 - 2. Filter, bedding, stone, and spalls.
 - 3. Filtration geotextile.
 - 4. Submit manufacturer information regarding size distribution and types of rock riprap, filter, bedding, stone, spalls, and filtration geotextile.
- B. Installers' data and specifications for equipment, including capacities to be used to set riprap stone on geotextile or filter, bedding, stone, and spall subgrade.

1.6 QUALITY ASSURANCE

- A. Furnish riprap stone and filter, bedding, stone, and spall material from single source throughout Work of this Section.
- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 MATERIALS

- A. Riprap Rock: Limestone type; broken stone and irregularly shaped rock; solid and nonfriable as specified.
- A. Furnish rock riprap materials according to the LA DOTD standards.
- B. Filter, Bedding, Stone, and Spalls: Tough, durable particles, free from thin, flat, and elongated pieces, with minimal quantities of organic matter and soft friable particles. Aggregates should

meet the quality requirements according to ASTM C33/C33M. Provide typical gradation requirements for filter, bedding, stone, and spall materials according to ASTM D6092.

- C. Filtration Geotextile: Adequately strong to withstand installation stresses during placement. Provide recommended geotextile properties for survival during construction according to AASHTO M 288 and as specified in Section 312500 "Erosion and Sedimentation Controls". Furnish according to LA DOTD standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify compacted subgrade, granular base or stabilized soil and installation of filtration geotextile is acceptable and ready to accept riprap stone or rubble riprap and imposed loads.
- C. Verify gradients and elevations of base or foundation for riprap Work are correct.

3.2 APPLICATION OF GEOTEXTILE FABRIC

- A. Place geotextile fabric over substrate as specified in Section 312500 "Erosion and Sedimentation Controls" and according to ASTM D6825.
- B. Avoid or resolve issues related to placement of riprap on geotextiles, which include the following:
 - 1. Survivability of the fabric.
 - 2. Clogging potential of the geotextile.
 - 3. Seam overstress or displacement of overlaps.
- C. For all installations, place geotextile without wrinkles or folds on a smooth graded surface in intimate contact with the soils.
- D. For installations where filtration is critical, riprap should be placed on a cushion layer of bedding material. Direct sunlight will degrade the underlying bedding or geotextile; therefore, it should not be visible.

3.3 APPLICATION OF ROCK RIPRAP

- A. Place stone riprap on prepared slopes or areas to produce a well-graded mass of stone with minimum practicable percentage of voids.
- B. Place the entire mass of stone to lines, grades, and full thickness shown on the plans and according to ASTM D6825 in one operation. Distribute the larger stones evenly and provide the entire mass of stone conforming to the gradation specified by the Architect/Engineer or

Representative. Place and distribute all riprap protection so there will be no significant accumulations of either the larger or smaller sizes of stone.

- C. Do not place riprap in layers or by dumping into chutes or other similar methods likely to cause segregation. Place riprap in a manner that produces an interlocked, well-graded mass of rock and avoids displacing the underlying material. Direct sunlight will degrade the underlying bedding or geotextile; therefore, it should not be visible.
- D. On slopes, place riprap at the bottom and work toward the top of the slope to prevent rolling or segregation.
- E. Place riprap where indicated on Drawings or as directed by Architect/Engineer.
- F. Place riprap into position and remove foreign material from surfaces.
- G. Do not place riprap over frozen or spongy subgrade surfaces.
- H. Average Installed Thickness: As indicated on Drawings or as directed by Architect/Engineer.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Particle Size Analysis of Natural and Manufactured Riprap Materials Test: Perform particle size analysis according to ASTM D5519.
- C. Inspect riprap at the quarry and the Jobsite to ensure proper gradation and that material does not contain excessive amounts of fines.
- D. Whenever riprap is being placed, Architect/Engineer or Representative will visually inspect the riprap placement operation and finish surface to ensure the following:
 - 1. That a dense, rough surface of well-keyed graded rock of the specified quality and sizes is obtained.
 - 2. That the layers are placed such that voids are minimized.
 - 3. That the layers are the specified thickness.
- E. Prepare test and inspection reports.

END OF SECTION 313716.13

Section 31 63 29 Drilled Concrete Piers and Shafts

Specifications

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.
- B. Specification Section 03 30 00 - Cast-in-Place Concrete shall be applicable to the concrete material used in drilled concrete piers. For drilled concrete piers, Section 31 63 29 shall supersede section 03 30 00 where specific items are addressed in both specification sections.

1.02 SUMMARY

- A. Section Includes:
 - 1. Dry-installed drilled piers (base bid)
 - 2. Installation requiring temporary steel casing (if required)
 - 3. Slurry displacement-installed drilled piers (if required)
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving At Building Pad" for preparation of subgrade for drilled-pier operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.
- C. Terminology:
 - 1. The terms Pier, Shaft, Caisson, Drilled Pier, Drilled Shaft, and Drilled Caisson shall all be considered equivalent terms/elements and shall be covered by this specification and the associated contract drawings.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For qualified Installer testing agency.
- D. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates.
 - 2. Field quality-control reports.
- F. Prepare test and inspection reports for each drilled pier as defined in Field Quality Control paragraph (Part 3) of this specification.
- G. Static Shaft Test Program:
 - 1. Two load tests shall be performed.
 - 2. Submit static test shaft loading scheme to the Structural Engineer and Project Architect for review prior to commencing shaft load test.
 - 3. Submit details of testing apparatus. These details shall be reviewed by the Structural Engineer and Project Architect prior to commencing load test.
 - 4. The testing agency shall record and provide to the Architect and General Contractor sufficient documentation of the shaft load test, such as graphs of loading versus shaft movement, to fully explain how the shaft reacted to applied loading. Submit report within three days of completing each test.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work that has completed at least three (3) successful projects.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.



Section 31 63 29 Drilled Concrete Piers and Shafts

Specifications

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- C. Testing and inspection services shall be conducted by the independent Testing Agency selected and paid for by the Owner. The Testing Agency employed by the Owner shall perform testing services required by Owner for shaft foundations including:
 - 1. Logging of all installed shafts.
 - 2. Conducting a shaft load test program as defined under the STATIC TEST SHAFT section of this specification and in conformance with the applicable requirements of the following standards and regulatory agencies.
 - a. American Society for Testing and Materials (ASTM).
 - b. International Building Code, 2012 Edition.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- E. Drilled-Pier Standards: Comply with ACI 336.1 and FHWA-NHI-18-024/FHWA GEC 010, unless modified in this Section.

1.05

PROJECT CONDITIONS

- A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
 - 1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
- B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Owner no fewer than three days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Owner's written permission.
- C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
 - 2. The geotechnical report is referenced in the Division 31 Section "Earth Moving".
- D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
 - 1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

PART 2 PRODUCTS

2.01

STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.
- D. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain. Cut bars true to length with ends square and free of burrs.

2.02

CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II.
 - a. Fly Ash: Not allowed in any concrete in this project.
 - b. Slag: Not allowed in any concrete in this project.
- B. Normal-Weight Aggregate: ASTM C 33, graded, 3/4-inch- nominal maximum coarse-aggregate size. Provide aggregate from a single source.

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Drilled Concrete Piers and Shafts

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1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - C. Water: ASTM C 94/C 94M and potable.
 - D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - E. Sand-Cement Grout: Portland cement, ASTM C 150, Type II; clean natural sand, ASTM C 404; and water to result in grout with a minimum 28-day compressive strength of 1000 psi, of consistency required for application.
- 2.03 STEEL CASINGS (IF REQUIRED)
- A. Temporary casing may be required due to conditions encountered at the site at the time of construction.
 - B. Steel Pipe Casings: ASTM A 283/A 283M, Grade C, or ASTM A 36/A 36M, carbon-steel plate, with joints full-penetration welded according to AWS D1.1/D1.1M.
- 2.04 SLURRY (IF REQUIRED)
- A. Slurry: Pulverized bentonite or polymers mixed with water to form stable colloidal suspension; complying with ACI 336.1 for density, viscosity, sand content, and pH.
- 2.05 CONCRETE MIXTURES
- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.
 - C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
 - D. Proportion normal-weight concrete mixture as indicated in the drawings:
- 2.06 FABRICATING REINFORCEMENT
- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."
- 2.07 CONCRETE MIXING
- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

- 3.01 PREPARATION
- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.
- 3.02 EXCAVATION
- A. Inspector from testing agency must be on site during excavation and concreting of all shafts. It is the Contractor's responsibility to notify the testing agency at least 48 hours in advance of any excavation work being performed.
 - B. The Engineer must be on site for the excavation and concreting of the first three shafts to be excavated on the project. It is the Contractor's responsibility to notify the engineer at least 48 hours in advance of any excavation work being performed.
 - C. special excavation, and obstruction removal and includes excavation to bearing elevations as follows:
 1. Standard excavation includes excavation accomplished with conventional augers fitted with soil or rock teeth or drilling buckets attached to drilling equipment of size, power, torque, and downthrust necessary for the Work.
 - D. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

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Drilled Concrete Piers and Shafts

Specifications

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- E. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.
 - 1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
 - 2. Remove water from excavated shafts before concreting.
 - 3. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
 - 4. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.
- F. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set for 24 hours. This applies to all drilled piers with a clear spacing of 72 inches or less.
- G. Slurry Displacement Method: Stabilize excavation with slurry maintained a minimum of 60 inches above ground-water level and above unstable soil strata to prevent caving or sloughing of shaft. Maintain slurry properties before concreting.
 - 1. Excavate and complete concreting of drilled pier on same day. If absolutely not possible, redrill, clean, and test slurry in excavation before concreting.
- H. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 - 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.
- I. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
 - 1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

3.03

STEEL REINFORCEMENT

- A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
- C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.
- D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.
- E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.
- F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.
- G. The steel reinforcing cage, consisting of longitudinal and transverse bars, ties, and cage stiffener bars, shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted, and prior to concrete placement. The reinforcing cage may be rigidly braced to retain its configuration during handling and construction.
 - 1. For shafts reinforced with a single longitudinal bar only, the reinforcement bar may be placed immediately after placement of concrete.

3.04

CONCRETE PLACEMENT

- A. See notes in Excavation regarding inspector being present during concreting and Engineer being on-site for concreting of first three shafts installed.
- B. Concrete must be placed within 30 minutes after excavation is drilled for each drilled pier.
- C. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.
 - 1. Construct a construction joint if concrete placement is delayed more than one hour. Level top surface of concrete. Before placing remainder of concrete, clean surface laitance, roughen, and slush concrete with commercial bonding agent or with sand-cement grout mixed at ratio of 1:1.
- D. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.

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Drilled Concrete Piers and Shafts

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1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps. Free-fall concrete placement is not allowed for drilled shafts with lengths greater than twenty-five (25) feet.
2. Vibrate top 60 inches of concrete.
- E. Slurry Displacement Method: Place concrete in slurry-filled shafts by tremie methods or pumping. Control placement operations to ensure that tremie or pump pipe is embedded no fewer than 60 inches into concrete and that flow of concrete is continuous from bottom to top of drilled pier.
 1. Shafts filled by use of slurry-displacement method shall be poured at least 12 inches above the necessary top elevation to ensure that all slurry has been displaced with uncontaminated concrete.
 2. After this required over-pour has been done, excess concrete may be removed without disturbing reinforcing steel.
- F. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
 1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.
- G. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.
- H. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.
- I. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F.
 1. Place concrete immediately on delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means for a minimum of seven days.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Owner shall engage a qualified special inspector to perform the following special inspections:
 1. Drilled piers.
 2. Excavation.
 3. Concrete.
- B. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections.
- C. Concrete Tests and Inspections: ASTM C 172 except modified for slump to comply with ASTM C 94/C 94M.
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 3 cu. yd., but less than 9 cu. yd., plus one set for each additional 27 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of discharge for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.

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Specifications

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- a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports for each drilled pier as follows:
 1. Concrete testing results.
 2. A numbered plan including all shafts.
 - a. Note shafts where concrete samples were taken.
 3. Actual excavated length and diameter of each shaft drilled.
 4. Note if any shaft irregularities have been observed.
 5. Note any problems with sloughing or collapsing of shaft walls.
 6. The approximate maximum height of free water inside of the excavated shaft prior to concreting of shaft.
 7. Note if water remained in shaft at commencement of concreting and provided estimated amount. Note if water was pumped from shaft excavation.
 8. Verification of proper reinforcement placement.
 9. Note any problems during excavating or concreting of shaft.
 10. Remarks, unusual conditions encountered, and deviations from requirements.

3.06 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate base course.
2. Concrete paving for:
 - a. Concrete sidewalks.
 - b. Concrete handicapped curb ramps.
 - c. Concrete stair steps.
 - d. Combination concrete curbs and gutters.
 - e. Concrete median barriers.
 - f. Concrete parking areas and drives.

B. Related Requirements:

1. Section 079000 - Joint Protection: Sealant for joints.
2. Section 099000 - Painting and Coating: Pavement markings.
3. Section 312213 - Rough Grading: Preparation of site for paving and base.
4. Section 312323 - Fill: Compacted subbase for paving.
5. Section 321123 - Aggregate Base Courses: Base course.
6. Section 321216 - Asphalt Paving: Asphalt wearing course.
7. Section 321713 - Parking Bumpers: Precast concrete parking bumpers.
8. Section 329119 - Landscape Grading: Preparation of subsoil at pavement perimeter.
9. Section 321416 - Brick Unit Paving: Brick pavers.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:

1. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
2. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
4. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
6. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
7. ASTM A775 - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
8. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
9. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
10. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
11. ASTM C33 - Standard Specification for Concrete Aggregates.
12. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
14. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
15. ASTM C150 - Standard Specification for Portland Cement.
16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
24. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
25. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
26. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
27. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
29. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
31. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
32. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.3 PRE-INSTALLATION MEETINGS

- A. Section 013000 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Submit data on concrete materials, joint filler, admixtures, and curing compounds.
- B. Design Data:
 - 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - 2. Identify mix ingredients and proportions, including admixtures.
- C. Source Quality Control Submittals: Indicate results of tests and inspections.

1.5 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).
- B. Obtain cementitious materials from same source throughout.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years' experience.

1.7 AMBIENT CONDITIONS

- A. Section 015000 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- A. Minimum Conditions: Do not place concrete if base surface temperature is less than 40 degrees F, or if surface is wet or frozen.
- B. Subsequent Conditions: Maintain minimum 50 degrees F, for not less than 72 hours after placing, and at a temperature above freezing for remainder of curing period.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

- A. Aggregate Base Course: As specified in Section 321123.

2.2 CONCRETE PAVING

A. Forms:

1. Height: Equal to full depth of finished sidewalk.
2. Material:
 - a. Wood: Straight and free from warping, twisting, loose knots, splits, or other defects.
3. Profile: To suit conditions.
4. Joint Filler:
 - a. Asphalt-impregnated fiberboard or Premolded compressible.
 - b. Thickness: 1/4 inch.
 - c. Comply with ASTM D994.

B. Reinforcement:

1. Deformed Reinforcing:
 - a. Steel: Comply with ASTM A615.
 - b. Yield Grade: 60 ksi.
 - c. Billet Bars: Deformed.
 - d. Finish: Uncoated.
2. Welded Deformed-Wire Fabric:
 - a. Comply with ASTM A1064.
 - b. Configuration: Flat sheets only.
 - c. Finish: Uncoated.
3. Dowels:
 - a. Description: Plain steel bars.
 - b. Comply with ASTM A615/A615M.
 - c. Yield Strength: 60 ksi.
 - d. Length: As indicated on Drawings.
 - e. Ends: Square, with burrs removed.
 - f. Finish: Uncoated.
4. Tie Wire:
 - a. Type: Annealed.

- b. Minimum Size: 16 gage.
- c. Finish: Uncoated.

C. Concrete:

- 1. Concrete Materials: Furnish materials according to LA DOTD standards.
- 2. Color Pigment:
 - a. Comply with ASTM C979.
 - b. Resistant to mineral oxides, alkalis, and fading.
 - c. Color: As selected.

2.3 FABRICATION

- A. Reinforcing: Comply with CRSI Manual of Practice and LA DOTD standards.
- B. Hooks: As indicated on Drawings.

2.4 MIXES

- A. Concrete: Comply with LA DOTD.

2.5 ACCESSORIES

- A. Curing Compound: Comply with LA DOTD Section 1011.01, ASTM C309 and shall be from approved material list.
- B. Joint Sealers: Comply with LA DOTD Section 1005.02 and shall be from approved material list.

2.6 SOURCE QUALITY CONTROL

- A. Submit proposed mix design of each class of concrete to Architect/Engineer for review prior to commencement of Work.
- B. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.
- C. Test samples according to ASTM C94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

1. Proof roll subbase with a tandem axle dump truck or similar heavy rubber-tired vehicle weighing approximately 15 to 20 tons. Soils which are observed to rut or deflect excessively under the moving load should be further undercut and replaced with properly compacted fill. The proof-rolling, undercutting and filling activities should be witnessed by Owners' representative or geotechnical engineer and should be performed during a period of dry weather.
 2. Remove soft subbase and replace with compacted fill as specified in Section 312323.
- B. Verify that gradients and elevations of subgrade are as indicated on Drawings.
- C. Verify reinforcing placement for proper size, spacing, location, and support.

3.2 PREPARATION

- A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Moisten substrate to minimize absorption of water from fresh concrete.
- C. Coat surfaces of all manholes, catch basin frames with oil to prevent bond with concrete paving.
- D. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

- A. Base Course: Install one of the following base courses,
1. 4 inch compacted granular base as specified in 321123 "Aggregate Base Courses".
 2. 9 inches of compacted low plasticity structural fill as specified in 321123 "Aggregate Base Courses".
- B. Forms:
1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
 3. Thoroughly wet wooden forms with water before concrete is placed.
- C. Reinforcement:
1. Place reinforcing at 2 inches from top of paving or as indicated on Drawings.
 2. Interrupt reinforcing at contraction and expansion joints.
 3. Place dowels in middle of paving to achieve paving alignment where indicated.
 4. Provide doweled joints as indicated on Drawings.
- D. Placing Concrete:
1. Slip-form technique will not be allowed.
 2. Place concrete in forms in one layer.
 3. Ensure that reinforcing, inserts, embedded parts and formed joints are not disturbed during concrete placement.

4. Place concrete continuously over full width of panel and between predetermined construction joints.
5. Do not break or interrupt successive pours such that cold joints occur.
6. Consolidate concrete by tamping and vibration.
7. Place concrete to pattern as indicated on Drawings.

E. Joints

1. Expansion Joints:

- a. Fill expansion joints with 1/2-inch-thick preformed expansion joint filler.
- b. Place expansion joints at maximum 100-foot intervals, and between intersecting paving and any fixed structure, such as a building, curbing and between intersecting paving and the handicapped curb ramps.
- c. Extend expansion joint material for full width and depth of paving.

2. Weakened Plane:

- a. Form weakened planes by a jointing tool, saw cutting or other acceptable means.
- b. Extend weakened planes into concrete for at least one-quarter of the depth. Weakened planes shall be approximately 1/8 inch wide.
- c. Space weakened planes for walks equal to the width of the walk.
- d. Form a longitudinal weakened plane along the centerline of drives more than 16-foot wide. Form transverse weakened planes at not more than 16-foot intervals.
- e. Form weakened planes for incidental paving at intervals not exceeding 30 times the thickness of the concrete in length or width.
- f. Construct joints in paving placed adjacent to jointed concrete to match existing joints, with intermediate joints formed as necessary not to exceed the maximum joint spacing and align curb, gutter, and sidewalk joints.

3. Construction Joints: Form construction joints around manholes, utility poles, etc., extending into paving. Install 1/4-inch-thick preformed expansion joint filler into these joints.

4. Filler:

- a. Place joint filler between paving components and building or other appurtenances.
- b. Recess top of filler 1/4 inch for sealant installation.

5. Provide keyed joints as indicated on Drawings.

6. Seal joints as indicated on Drawings and according to Section 079000 "Joint Protection".

F. Finishing:

1. Sidewalk Paving: Light broom, edge radius to 1/8-inch radius, and trowel joint edges.
2. Median Barrier and Curbs: Light broom, edge radius to 1/4-inch radius, and trowel joint edges.
3. Direction of Texturing: Transverse to paving direction.
4. Ramps: V-jointed perpendicular to slope.
5. Spalled corners and edges shall be cleaned and filled with mortar mixture and finish.
6. Place curing compound on exposed concrete surfaces immediately after finishing.

G. Curing and Protection

1. Comply with LA DOTD Section 601.03.10.
2. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
3. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
4. Membrane Curing:
 - a. Apply membrane-curing compound uniformly to exposed surface after free water has disappeared from finished surface and before concrete has dried.
 - b. Apply compound in two coats, with second coat applied perpendicular to first coat.
 - c. If concrete has dried, moisten dried surface and apply curing compound as soon as free water disappears.

H. Backfilling: After curing, backfill, grade, and compact adjacent disturbed area as indicated.

3.4 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.
- B. Maximum Variation from True Position: 1/4 inch.
- C. Line and Grade for Forms: 1/8 inch in any 10-foot-long section.

3.5 FIELD QUALITY CONTROL

- A. Perform field inspection and testing according to ASTM C94 and LA DOTD standards.
- B. Inspect reinforcing placement for size, spacing, location, support.
- C. Testing firm will take cylinders and perform slump and air entrainment tests according to ACI 301.
- D. Strength Test Samples:
 1. Sampling Procedures: Comply with ASTM C172.
 2. Cylinder Molding and Curing Procedures: Comply with ASTM C31, standard cured.
 3. Sample concrete and make one set of four cylinders for every 50 cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area paving.
 4. Make one additional cylinder during cold-weather concreting, and field cure. Cylinder Compressive Strength Testing:
 5. Test Method: ASTM C39.
 6. Test Acceptance: Average compressive strength of three consecutive test maximum 500 psi less than specified compressive strength according to LA DOTD standards.
 7. Test one cylinder at seven days, and two cylinders at 28 days.
 8. Retain one cylinder for 28 days for testing when requested by Architect/Engineer.

- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 PROTECTION

- A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over paving for 7-days minimum after finishing or until 75 percent design strength of concrete has been achieved.
- C. Do not permit vehicular traffic over paving for 14-days minimum after finishing or until 85 percent design strength of concrete has been achieved.

3.7 ATTACHMENTS

- A. Concrete Sidewalks and Incidental Paving: LA DOTD Class M (3,000 psi 28 day concrete), 5 inches thick, 6" x 6" 10/10 (D1.4) mesh reinforcing sheets, broom finish.
- B. Drives and Dumpster Paving: LA DOTD Type B or D (4,000 psi 28 day concrete), 8 inches thick, 6" x 6" 6/6 (D2.9) mesh reinforcing sheets, wood float finish.

END OF SECTION 321313

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Traffic lines and markings.
2. Legends.
3. Paint.
4. Glass beads.

B. Related Requirements:

1. Section 321216 - Asphalt Paving: Asphalt paving for roads, parking areas, and sidewalks.
2. Section 321313 - Concrete Paving: Concrete paving for roads, parking areas, and sidewalks.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO M247 - Standard Specification for Glass Beads Used in Pavement Markings.

B. ASTM International:

1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
6. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
7. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
8. ASTM D1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
9. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings.
10. ASTM D2202 - Standard Test Method for Slump of Sealants.
11. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
12. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.

13. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.
14. ASTM D4280 - Standard Specification for Extended Life Type, Nonplowable, Raised Retroreflective Pavement Markers.
15. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life.

1.3 SUBMITTALS

- A. Section 013300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit paint formulation for each type of paint.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Test and Evaluation Reports: Indicate source and acceptance test results according to AASHTO M247.
- E. Manufacturer Instructions:
 1. Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, and bead embedment and application rate.
 2. Submit detailed instructions on installation requirements, including storage and handling procedures.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.4 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.
- B. Applicator: Company specializing in performing Work of this Section with minimum three years' experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:

1. According to manufacturer instructions.
2. Paint:
 - a. Invert containers several days prior to use if paint has been stored more than two months.
 - b. Minimize exposure to air when transferring paint.
 - c. Seal drums and tanks when not in use.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

- A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not apply materials if surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow if relative humidity is outside range required by paint manufacturer, or if moisture content of surfaces exceeds that required by paint manufacturer.
- D. Minimum Conditions: Do not apply paint if temperatures are expected to fall below [60] [50] deg. F within 24 hours after application.
- E. Thermoplastic Compound: Do not apply unless pavement surface temperature is minimum 40 deg. F and rising.
- F. Maximum VOCs: Do not exceed limit required by State or Environmental Protection Agency.

1.8 WARRANTY

- A. Section 017000 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish 3-year manufacturer's warranty for pavement markings.

PART 2 - PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

- A. Manufacturers:

1. Aexcel Inc.
2. Color Wheel Paints & Coatings.
3. Columbia Paint & Coatings, Inc.; a subsidiary of Sherwin-Williams Company (The).
4. Conco Paints.
5. Coronado Paint; Benjamin Moore & Co.
6. Diamond Vogel Paints.
7. Ennis-Flint.
8. EZ-Liner Industries.
9. Franklin Paint Company.
10. McCormick Paints.
11. Pathmark Traffic Products of Texas Inc.
12. Safety Coatings, Inc.
13. Scott Paint.
14. Furnish materials according to LA DOTD AML list standards.

B. Paint, Glass Beads, Thermoplastic Compound, Preformed Tape and Raised Pavement Markers:

1. Per LA DOTD specifications and approved material list.

2.2 APPLICATION EQUIPMENT

A. Paint Gun:

1. Description: Simultaneously apply parallel lines of indicated width in solid or broken patterns or various combinations of those patterns.
2. Type: Dual nozzle.

B. Bead Gun:

1. Description: Automatically dispense glass beads onto painted surface at required application rate.
2. Type: Pressurized.

C. Measuring Device: Automatically and continuously measure to nearest foot length of each line placed.

D. Paint Heater: Capable of heating paint to required temperature for fast-dry applications.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Test and analyze traffic paints according to LA DOTD requirements.

C. Owner Inspection:

1. Make completed paints and glass beads available for inspection at manufacturer's factory prior to packaging for shipment.
2. Notify Owner at least seven days before inspection is allowed.

D. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Do not apply paint to concrete surfaces until concrete has cured for 28 days.
- B. Agitate paint for 1 to 15 minutes prior to application to ensure even distribution of pigment.
- C. Maintenance and Protection of Traffic:
 1. Provide short-term traffic control as specified in Section 015000 - Temporary Facilities and Controls.
 2. Prevent interference with marking operations and prevent traffic on newly applied markings before dry.
 3. Maintain access to existing businesses and other properties requiring access.
- D. Surface Preparation.
 1. Clean and dry paved surfaces prior to painting.
 2. Blow or sweep surface free of dirt, debris, oil, grease, or gasoline.
 3. Spot location of final pavement markings, as specified and as indicated on Drawings, by applying pavement spots 25 feet o.c.
 4. Request inspection by Architect/Engineer after placing pavement spots and minimum three days prior to applying traffic lines.

3.2 DEMOLITION

- A. Remove existing markings in an acceptable manner, using methods that will cause least damage to pavement structure or surface.
- B. Do not remove existing pavement markings by painting over with blank paint.
- C. Repair pavement or surface damage caused by removal methods.
- D. Clean and repair existing, remaining, or reinstalled lines and legends.

3.3 APPLICATION

- A. Application Rate:
 1. Reflective Markings:

- a. Paint: 100 sq. ft./gal.
 - b. Glass Spheres on Wet Paint: 0.5 lb./gal.
2. Nonreflective Markings:
 - a. Paint: 100 sq. ft./gal.
3. Thermoplastic Compound:
 - a. After surface preparation has been completed, prime pavement surface with spray equipment and allow primer materials to dry according to thermoplastic manufacturer recommendations.
 - b. Apply thermoplastic at temperatures not less than 375 deg. F and not greater than 425 deg. F at point of deposition.
 - c. Apply reflective glass spheres mechanically at rate of 1 lb./20 sq. ft.
 - d. Application Thickness: Not less than 0.125 inch and not more than 0.190 inch.
- B. Painting:
 1. Apply paint pneumatically, using guidelines and templates as necessary to control application.
 2. Manually paint numbers, letters, and symbols.
 3. Prevent splattering and overspray when applying markings.
 4. Paint Guns: Simultaneously apply paint binder at uniform specified rates.
 5. Dispense at ambient temperature.
 6. Wet-Film Thickness:
 - a. 15 mils.
 - b. Edge Markings: 12 mils.
- C. Reflective Media:
 1. Immediately follow paint application.
 2. Bead Guns:
 - a. Dispense glass beads simultaneously at specified rate.
 - b. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time.
 - c. Verify weight of glass beads.
- D. Thermoplastic Compound:
 1. Place on dry pavement.
 2. Apply centerline, skip line, edge line, and other longitudinal type markings with mobile applicator.
 3. Place special markings, crosswalks, stop bars, legends, arrows, and similar patterns with portable applicator.
- E. Raised Pavement Markers:
 1. Align prefabricated markers and permanently fix in place by means of epoxy adhesives.

2. Prior to applying adhesive, thoroughly clean area by water blasting and by compressed air.

F. Dimensions and Locations: As indicated on Drawings.

G. Crosswalks, Intersections, Stop Lines, and Legends:

1. Use walk-behind stripers, hand spray, or stencil trucks.
2. Do not use hand brushes or rollers.
3. Glass beads may be applied by hand.

H. Installation Standards: Install Work according to LA DOTD standards.

3.4 TOLERANCES

- A. Maximum Variation from Wet Film Thickness: 1 mil.
- B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.
- C. Automatic Line-Length Gages: Plus or minus 25 ft./mi.
- D. Cycle Length Timer: Plus or minus 6 in./ 40 ft.
- E. Paint Line-Length Timer: Plus or minus 3 in./ 10 ft.
- F. Paint Guns: Plus or minus 1 mil.

3.5 FIELD QUALITY CONTROL

- A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.
- B. Acceptance:
 1. Repair lines and markings which after application and curing do not meet following criteria:
 - a. Incorrect location.
 - b. Insufficient thickness, width, coverage, or retention.
 - c. Uncured or discolored material.
 - d. Insufficient bonding.

3.6 CLEANING

- A. Section 017000 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Collect and legally dispose of residues from painting operations.

3.7 PROTECTION

- A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free.
- B. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free.
- C. If vehicle crosses a marking and tracks it, or if splattering or overspray occurs, eradicate affected marking and resultant tracking and apply new markings.
- D. Follow manufacturer instructions or use minimum of 30 minutes of dry time.
- E. Barrier cones are satisfactory protection for materials being dried.

3.8 MAINTENANCE

- A. Provide service and maintenance of traffic paints for three years from date of Substantial Completion.

3.9 ATTACHMENTS

- A. Pavement Markings:
 - 1. Edge: 4-inch; white; conventional.
 - 2. Stop Line: 24-inch; white; fast-dry.
 - 3. Centerlines, Parking and No Parking/Warning Areas: 4-inch; yellow; conventional.
 - 4. Handicapped Parking: 4-inch; blue; conventional.

END OF SECTION 321723

SECTION 321726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Tactile warning surfacing and accessories.
- B. Related Requirements:
 - 1. Section 015000 - Temporary Facilities and Controls: Short-term traffic control as required by this Section.
 - 2. Section 321216 - Asphalt Paving: Coordination with paving systems for equipment specified in this Section.
 - 3. Section 321313 - Concrete Paving: Coordination with paving systems for equipment specified in this Section.

1.2 REFERENCE STANDARDS

- A. American Association of State and Highway Transportation Officials:
 - 1. AASHTO HB-17 - Standard Specifications for Highway Bridges.
- B. ASTM International:
 - 1. ASTM C1208 - Standard Specification for Vitrified Clay Pipe and Joints for Use in Microtunneling, Sliplining, Pipe Bursting, and Tunnels.
 - 2. ASTM C1208M - Standard Specification for Vitrified Clay Pipe and Joints for Use in Microtunneling, Sliplining, Pipe Bursting, and Tunnels.
 - 3. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 4. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 5. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
 - 6. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
 - 7. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 8. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
 - 9. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness.
 - 10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 11. ASTM E303 - Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
 - 12. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

13. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
14. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
15. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

C. U.S. Architectural and Transportation Barriers Compliance Board (Access Board):

1. Americans with Disabilities Act (ADA) - Accessibility Guidelines for Buildings and Facilities.

1.3 COORDINATION

- A. Coordinate Work of this Section with Work of other Sections.

1.4 PREINSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's information including characteristics, dimensions, domes, and special shapes.
- B. Manufacturer's Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- C. Manufacturer Reports:
1. Certify that equipment has been installed according to manufacturer's instructions.
 2. Indicate activities on Site, adverse findings, and recommendations.

1.6 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store and protect materials according to manufacturer's instructions.

1.9 WARRANTY

- A. Furnish five-year manufacturer's warranty for tactile warning surfacing.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING

A. Manufacturer List:

- 1. Detectable Warning Systems, Inc.
- 2. Engineered Plastics, Inc.
- 3. Furnish materials according to LA DOTD standards.

B. Description:

- 1. ADA-compliant tactile warning surfaces for visually impaired pedestrians.
- 2. Suitable for installation on both asphalt and concrete.

C. Design and Performance Criteria:

- 1. Loading: Single-wheel HS20-44, according to AASHTO HB-17.
- 2. Resistant to impacts, wear, freeze-thaw, UV exposure, and stains.
- 3. Fire Spread: Less than 15 when tested according to ASTM E84.
- 4. Slip Resistance: 0.90, according to ASTM E303.
- 5. Taber Abrasion: 150 mgs, according to ASTM D1044.
- 6. Durometer Hardness: 90, according to ASTM D2240, Type A.
- 7. Water Absorption:
 - a. Comply with ASTM D570.
 - b. Maximum: 0.05 percent.
- 8. Slip Resistance:
 - a. Dry: 1.03.
 - b. Wet: 0.83.
 - c. Comply with ASTM C1208.
 - d. Wheelchair Safety: Furnish minimum 40, 90-degree raised points per sq. in.
- 9. Domes:
 - a. Spacing: 2.35 inches, o.c., measured diagonally.

- b. Size: 0.9-inch base bottom diameter, 0.45-inch top diameter, 0.2 inches high.

D. Surface-Applied Tile Type:

- 1. Material: Polymer-concrete composite.
- 2. Length and Width: 24 by 48 inches.
- 3. Color: Yellow.
- 4. Anchors: Stainless steel.

E. Modular Pavers:

- 1. Material: Polymer/concrete composite.
- 2. Length and Width: 24 by 48 inches.
- 3. Depth: 1-3/8 inches.
- 4. Face Thickness: 3/16 inch.
- 5. Color: Yellow.

2.2 SOURCE QUALITY CONTROL

- A. Provide shop inspection and testing of tactile warning surfacing units.
- B. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
 - 1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is level or to correct grade, is smooth, is capable of supporting tactile warning surface units and imposed loads, and is otherwise ready to receive Work of this Section.

3.2 PREPARATION

- A. Maintenance and Protection of Traffic:
 - 1. Provide short-term traffic control as specified in Section 015000 - Temporary Facilities and Controls.
 - 2. Prevent interference with operations.
 - 3. Maintain travel lanes between 7:00 AM to 9:00 AM and between 4:00 PM and 6:00 PM.
 - 4. Maintain access to existing businesses and other properties requiring access.
- B. Surface Preparation:
 - 1. Clean and dry paved surface prior to installing tactile warning surface modules.

2. Blow or sweep surface free of dirt, debris, oil, grease, or gasoline.

C. Existing Work:

1. Remove existing tactile warning surface modules by methods that will cause least damage to pavement surface.
2. Repair pavement or surface damage caused by removal operations.

3.3 INSTALLATION

- A. Install tactile warning surfacing according to manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

- A. Inspect for correct location, extent of coverage, and final grade.

B. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

- C. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.5 CLEANING

- A. Clean tactile warning surfacing according to manufacturer's instructions.

3.6 PROTECTION

- A. Protect tactile warning surfacing from vehicular and pedestrian traffic on newly installed tactile warning surface modules for period of time as instructed by manufacturer.

3.7 MAINTENANCE

- A. Furnish service and maintenance of tactile warning surfacing for three years from date of Substantial Completion.

END OF SECTION 321726

Section 32 31 13 Chain Link Fences and Gates

Specifications

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vinyl coated fence framework, fabric, and accessories at: fences within areas as indicated in drawings.
- B. Excavation for post bases; concrete foundation for posts.
- C. Manual gates and related hardware; rolling cantilever gates to be relocated/reused.

1.02 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete: Strength of concrete.

1.03 REFERENCES

- A. ASTM A116 - Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
- B. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.
- E. ASTM C94 - Ready-mixed Concrete.
- F. ASTM F567 - Installation of Chain-Link Fence.
- G. Chain Link Fence Manufacturers Institute (CLFMI) - Product Manual.
- H. Industrial Fencing Specifications of the International Fence Industry Association and the Chainlink Manufacturers Institute.

1.04 SYSTEM DESCRIPTION

- A. Fence Height: Reference drawings.
- B. Line Post Spacing: At intervals not exceeding 10 feet on ground.
- B. Concrete Footings: 36" deep (48" when height exceeds 6') by 12" diameter; allow minimum 2" ground cover of top of footing.
- C. All materials and accessories for the project shall be provided from a single source.

1.05 SUBMITTALS

- A. Manufacturer's Product Data and Installation Instructions: Indicate product specs, installation requirements and procedures.
- B. Elevation of fence, components, indicating height, depth of footings, coatings.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM F567.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Robison Fence Co.
- B. Scott Fence
- C. Hagan Fence

2.02 MATERIALS AND COMPONENTS

- A. Materials and Components: Conform to CLFMI Product Manual.
- B. Fabric Size: CLFMI Standard Industrial service.
- C. *Intermediate Posts: Type I round.*
- D. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round.
- E. Concrete: In compliance with ACI standards for such applications.

2.03 COMPONENTS

- A. All components are core gauge and thicknesses; vinyl coating is not included in the thickness.
- B. Fabric: 2-inch diamond mesh. Min. 9 gauge galvanized steel wire. Knuckle selvage top & bottom.
- C. Terminal Posts & Gate Posts: 3-inch o.d. hot-dipped galvanized schedule 40 steel pipe. Provide minimum 36-inch embedment.

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Chain Link Fences and Gates

Specifications

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- D. Line Posts: 2-inch o.d. hot-dipped galvanized schedule 40 steel pipe; min 30-inch embedment
- E. Post Caps: Required for all posts; size to suit posts; integral eye for passage of top rail or tension wire.
- F. Top Rails: 1-5/8-inch o.d. hot-dipped galvanized schedule 40 steel pipe. Fabricate for swedge-type joints. Required on all fencing.
- G. Braces: Material same as top rail
- H. Fabric Tension Bars: 3/16" x 3/4" hot-dipped galvanized, single-piece full-height of fabric. Bands shall be 11 gauge x 7/8" wide.
- I. Tension Wire: 7 gauge coated steel coil spring wire. Required at bottom of all fencing.
- J. Vinyl Coating: Class 2b, thermally fused and bonded to components; Color: Black.
- K. Gates:
 - a. Framework & diagonal bracing: same as top rail pipe, shop fabricated welded construction, all welds ground smooth, hot dipped galvanized
 - b. Hinges: Offset non-liftoff type to achieve 180 degree opening; minimum 1 for each 24 inches of gate height or fraction thereof.
 - c. Latch: permitting operation from both sides of gate, hinges, center gate stops and, for each gate leaf more than 5'-0", keepers. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of.
 - d. Keeper: one/each leaf; automatically engages leaf & holds leaf open until manually released.
 - e. Provide and install min 6-inch long galvanized receptor sleeve in concrete for drop rod/ gate stop

2.05 FINISHES

- A. Components and Fabric: Galvanized to ASTM A123; 1.2 oz/sq ft zinc coating.
- B. Hardware: Galvanized to ASTM A153, 1.8 oz/sq ft coating.
- C. Accessories: Same finish as framing.
- D. Vinyl Coating: Class 2b, thermally fused and bonded to components; Color: Black, match existing fencing on site.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All posts set plumb. All permanent fencing posts set in the appropriate plan center of 3000 psi concrete footings in firm solid earth. Terminal and gate posts set in 12-inch diameter x 42-inch deep footings; line posts set in 10-inch diameter x 36-inch deep footings. Post lengths to achieve minimum 6-inch concrete coverage around post bottom and sides; posts shall not contact earth. Top of concrete finished smooth, set to finished grade, and sloped away from post to shed water. Exposed post height to achieve required fabric height plus 2-inches of fabric clearance above finished grade.
- B. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- C. Place fabric on inside of posts and rails; fabric shall completely enclose west face of service area.
- D. Set terminal and gate, posts plumb, 2 inches above finish grade. Slope top of concrete for water runoff.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.
- F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts.
- G. Do not stretch fabric until concrete foundation has cured 7 days.
- H. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- I. Position bottom of fabric 2 inches above finished grade.
- J. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- K. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- L. Install bottom tension wire stretched taut between terminal posts.
- M. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt retainer and locking clamp.
- N. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- O. At mechanical equipment enclosure: Install two intermediate top rails and install chain link fabric across top to completely enclose mechanical equipment.
- P. Remove temporary construction fencing at completion of project

3.02 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch .

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Chain Link Fences and Gates
Specifications

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- B. Maximum Offset From True Position: 1 inch .

END OF SECTION

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparation of subsoil.
2. Soil testing.
3. Placing topsoil.

B. Related Sections:

1. Section 312213 - Rough Grading: Rough grading of site.
2. Section 312316.13 - Trenching: Rough grading over cut.
3. Section 328400 - Planting Irrigation.
4. Section 329119 - Landscape Grading: Preparation of subsoil and placement of topsoil in preparation for the Work of this section.
5. Section 329219 - Seeding
6. Section 329223 - Sodding.
7. Section 329300 - Plants.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

1.3 QUALITY ASSURANCE

A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

1.4 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate with installation of underground sprinkler system piping and watering heads.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Topsoil: As specified in Section 310513. Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

2.2 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.
- D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL

- A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
- C. Scarify subsoil to depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

- A. Spread topsoil to minimum depth of 4 inches over area to be seeded. Rake until smooth.

- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

END OF SECTION 329113

SECTION 329219 - SEEDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Seed mixture.
- B. Related Requirements:
 - 1. Section 312213 "Rough Grading" for rough grading of Site.
 - 2. Section 312316.13 "Trenching" for rough grading over cut.
 - 3. Section 320513 "Soils for Exterior Improvements" for topsoil material.
 - 4. Section 329113 "Soil Preparation."

1.2 DEFINITIONS

- A. Weeds: A vegetative species other than specified species to be established in given area. Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Seed mixture.
 - 2. Submit data for seed mix, fertilizer, mulch and other accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency and recommended coverage of fertilizer.

1.5 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.7 MAINTENANCE SERVICE

- A. Maintain seeded areas for three months from Date of Substantial Completion.
- B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for two cuttings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

2.2 SEED MIXTURE

- A. Description: Furnish according to LA DOTD Section 717.

2.3 ACCESSORIES

- A. Mulching Material: Furnish according to LA DOTD Section 716.
- B. Fertilizer and Agricultural Lime: Furnish according to LA DOTD Section 734.
- C. Water: Clean, fresh, and free of substances or matter capable of inhibiting vigorous growth of grass.
- D. Erosion Fabric: Jute matting, open weave.
- E. Herbicide: As directed.
- F. Stakes: Softwood lumber, chisel pointed.
- G. String: Inorganic fiber.

2.4 SOURCE QUALITY CONTROL

- A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.
- B. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

- C. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify prepared soil base is ready to receive the Work of this Section.

3.2 FERTILIZING

- A. Apply lime at application rate recommended by soil analysis. Work lime into top 4 inches of soil.
- B. Apply fertilizer at application rate recommended by soil analysis.
- C. Apply after smooth raking of topsoil and prior to roller compaction.
- D. Do not apply fertilizer at same time or with same machine used to apply seed.
- E. Mix fertilizer thoroughly into upper 2 inches of topsoil.
- F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

- A. Apply seed at rate as specified evenly in two intersecting directions. Rake in lightly.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- D. Roll seeded area with roller if necessary.
- E. Immediately following seeding and compacting, apply mulch. Maintain clear of shrubs and trees.
- F. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate as specified in LA DOTD Section 739 evenly in one pass.

- B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

- A. Identify seeded areas with stakes and string around area periphery if directed. Set string height to 12 inches. Space stakes at 10 feet.
- B. Cover seeded slopes where grade is 3 in./ft. or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- C. Lay fabric smoothly on surface, bury top end of each section in 6-inch-deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.
- D. Secure outside edges and overlaps at 36-inch intervals with stakes.
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

- A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.
- B. Neatly trim edges and hand clip where necessary.
- C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.
- D. Water to prevent grass and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas showing bare spots.
- H. Repair washouts or gullies.
- I. Protect seeded areas with warning signs during maintenance period.

END OF SECTION 329219

SECTION 330110.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Disinfection chemicals.
- B. Related Requirements:
 - 1. Section 331416 "Site Water Utility Distribution Piping" for product and execution requirements for installation and testing of site domestic water distribution piping.

1.2 SUBMITTALS

- A. Disinfection Procedure:
 - 1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.
- B. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.
- C. Certify that final water complies with disinfectant quality standards of authority having jurisdiction.
- D. Material Test Reports: For each disinfectant, by a qualified testing agency.
- E. Field Quality-Control Reports: For disinfection chemicals.
- F. Qualifications Statements: For manufacturer and applicator.

1.3 CLOSEOUT SUBMITTALS

- A. Disinfection Report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and completion.
 - 3. Test locations.
 - 4. Name of person collecting samples.
 - 5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
 - 6. Date and time of flushing start and completion.
 - 7. Disinfectant residual after flushing in ppm for each outlet tested.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

- B. Applicators Qualifications: Company specializing in performing Work of this Section with minimum three years' experience.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to:
 - 1. The Municipality Department of Public Works standards.
 - 2. Disinfection shall be performed in accordance with the latest AWWA C651 standards.

2.2 DISINFECTION CHEMICALS

- A. Chemicals:
 - 1. Hypochlorite: Comply with AWWA B300.
 - 2. Ammonium Sulfate: Comply with AWWA B302.
 - 3. Sodium Chlorite: Comply with AWWA B303.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that piping system has been cleaned, inspected, and pressure tested.
- C. Verify that access fittings have been installed under Section 331416 "Site Water Utility Distribution Piping."
- D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DISINFECTION CHEMICALS

- A. Provide required equipment to perform Work of this Section.
- B. Introduce treatment into piping system.
- C. Maintain disinfectant in system for 24 hours.
- D. Flush, circulate, and clean until required disinfectant quality standard has been achieved using municipal domestic water.

- E. Replace permanent system devices that were removed for disinfection.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Disinfection, Flushing, and Sampling:
 - 1. Disinfect pipeline installation according to AWWA C651.
 - 2. Use of liquid chlorine is not permitted.
 - 3. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
 - 4. Disposal:
 - a. Legally dispose of chlorinated water.
 - b. If chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
 - 5. After final flushing and before pipeline is connected to existing system or placed in service, certify that disinfectant level meets quality standards of authority having jurisdiction.
- C. Prepare test and inspection reports.

END OF SECTION 330110.58

SECTION 330130.11 - TELEVISION INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: DVDs.
- B. Related Requirements:
 - 1. Section 333100 "Sanitary Sewerage Piping" or 333111 "Public Sanitary Sewerage Gravity Piping" for pipe materials, manholes, and accessories normally encountered with gravity sewerage piping.

1.2 DEFINITIONS

- A. DVD: An optical disc storage format, offering higher storage capacity than compact discs (CDs) while having the same dimensions.

1.3 COORDINATION

- A. Coordinate Work of this Section with Architect/Engineer, Municipality and Utility Provider.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Convene minimum one week prior to commencing Work of this Section at Project site.

1.5 SCHEDULING

- A. Furnish Work schedule for periods of time when sewer piping section is out of service for joint sealing.
- B. Schedule Work of this Section to coincide with joint sealing.

1.6 SUBMITTALS

- A. DVDs:
 - 1. Submit three copies of completed narrated color DVDs identified by Project name, street name, right-of-way property name, and manhole numbers.
 - 2. DVDs become property of Owner.
- B. Inspection Logs:

1. Submit cleaning and television inspection logs for each section of sewer line to be rehabilitated.
2. Include following minimum information:
 - a. Stationing and location of lateral services, wyes, or tees.
 - b. Date and clock time references.
 - c. Pipe joints.
 - d. Infiltration/inflow defects.
 - e. Cracks.
 - f. Leaks.
 - g. Offset joints.
- C. Submit specific detailed description of proposed bypass pumping system, including written description of plan addressing schedule, quantity, capacity, and location of pumping equipment.
- D. Submit spill plan to address any spills that might occur.
- E. Qualifications Statement: For applicator.

1.7 QUALITY ASSURANCE

- A. Applicators Qualifications: Company specializing in performing Work of this Section with minimum three years' experience.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to The Municipality of Department of Public Works standards.

2.2 DVDs

- A. Description: Digital video formatted discs.
- B. Audio track containing simultaneously recorded narrative commentary and evaluations of videographer, describing in detail condition of pipeline interior.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify location of sewer pipelines to be inspected.

3.2 PREPARATION

- A. Flush and clean pipeline to remove sludge, dirt, sand, stone, grease, and other materials to ensure clear view of interior conditions.
- B. Debris:
 - 1. Intercept flushed debris at next downstream manhole using weir or screening device.
 - 2. Remove and dispose of debris off Site.
- C. Bypassing:
 - 1. Furnish temporary bypass pumping system around Work area for time required to complete television inspection.
 - 2. Provide standby pump of equal or greater capacity at bypass location.
 - 3. Provide safety precautions, including barricades, lights, and flaggers as specified in Section 015000 "Temporary Facilities and Controls."

3.3 APPLICATION OF TELEVISION INSPECTION OF SEWERS

- A. Closed-Circuit Television (CCTV) Camera System:
 - 1. Use cameras specifically designed and constructed for closed-circuit sewer line inspection.
 - 2. Use camera equipment with pan-and-tilt capability to view each lateral connection at multiple angles.
 - 3. Use camera capable of moving both upstream and downstream with minimum 1,000 feet horizontal distance within one setup and using direct-reading cable position meter.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Pipeline Inspection:
 - 1. Audio-video record sections of sewer pipeline between designated manholes.
 - 2. Identify and record locations of flat grades, dips, deflected joints, open joints, broken pipe, protrusions into pipeline, and points of infiltration.
 - 3. Locate and record service connections.
 - 4. Record locations of pipeline defects, connection horizontal distance in feet, and direction from manholes.
 - 5. Video-record with pipe section plugged to view 100 percent of pipe ID.
 - 6. Use flow-control methods as specified for bypass pumping system to eliminate surcharging and to reduce flow.
- C. Prepare test and inspection reports.

END OF SECTION 330130.11

SECTION 330505.41 - AIR TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Air testing equipment.
- B. Related Requirements:
 - 1. Section 333100 "Sanitary Sewerage Piping" or 333111 "Public Sanitary Sewerage Gravity Piping" for pipe materials, manholes, and accessories normally encountered with gravity sewerage piping.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Air testing equipment.
 - 2. Testing procedures.
 - 3. List of test equipment.
 - 4. Testing sequence schedule.
 - 5. Provisions for disposal of flushing and test water.
 - 6. Certification of test gage calibration.
- B. Product Test Reports: For piping, for tests performed by qualified testing agency.
- C. Qualifications Statement: For testing agency.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Company specializing in performing Work of this Section with minimum three years' experience.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the Municipality Department of Public Works standards.

2.2 AIR TESTING EQUIPMENT

- A. Air compressor.
- B. Air supply line.

- C. Shutoff valves.
- D. Pressure regulator.
- E. Pressure relief valve.
- F. Stopwatch.
- G. Plugs.
- H. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.
- D. Proceed with testing only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lamping:
 - 1. Lamp gravity piping after flushing and cleaning.
 - 2. Perform lamping operation by shining light at one end of each pipe section between manholes.
 - 3. Observe light at other end.
 - 4. Pipe not installed with uniform line and grade will be rejected.
 - 5. Remove and reinstall rejected pipe sections.
 - 6. Clean and lamp until pipe section is installed to uniform line and grade.
- B. Plugs:
 - 1. Plug outlets, wye branches, and laterals.
 - 2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Low-Pressure Air Testing:

1. Test each reach of gravity sewer piping between manholes.
2. Introduce air pressure slowly to approximately 4 psig.
3. Determine ground water elevation above spring line of piping.
4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
5. Do not increase pressure above 10 psig.
6. Allow pressure to stabilize for at least five minutes.
7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
8. Do not make allowance for laterals.
9. Minimum Testing Duration in Minutes Per 100 Feet (30 m):
 - a. Pipe Size 3 Inches (75 mm): 0.2.
 - b. Pipe Size 4 Inches (100 mm): 0.3.
 - c. Pipe Size 6 Inches (150 mm): 0.7.
 - d. Pipe Size 8 Inches (200 mm): 1.2.
 - e. Pipe Size 10 Inches (250 mm): 1.5.
 - f. Pipe Size 12 Inches (300 mm): 1.8.
 - g. Pipe Size 15 Inches (375 mm): 2.1.
 - h. Pipe Size 18 Inches (450 mm): 2.4.
 - i. Pipe Size 21 Inches (525 mm): 3.0.
 - j. Pipe Size 24 Inches (600 mm): 3.6.
 - k. Pipe Size 27 Inches (675 mm): 4.2.
 - l. Pipe Size 30 Inches (750 mm): 4.8.
 - m. Pipe Size 33 Inches (825 mm): 5.4.
 - n. Pipe Size 36 Inches (900 mm): 6.0.
10. Record drop in pressure during testing period.
11. If air pressure drops more than 1.0 psi during testing period, piping has failed.
12. If 1.0-psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
13. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
14. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
15. Repair visible leaks regardless of quantity of leakage.

C. Prepare test and inspection reports.

END OF SECTION 330505.41

SECTION 330507.13 - UTILITY DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Horizontal directional drilling.
- B. Related Requirements:
 - 1. Section 310513 "Soils for Earthwork" for subsoil fill as required by this Section.
 - 2. Section 312316 "Excavation" for excavation of subsoil and excavation supports as required by this Section.
 - 3. Section 312316.13 "Trenching" for trenching as required by this Section.
 - 4. Section 312323 "Fill" for installation and compaction requirements for backfilling.
 - 5. Section 312323.33 "Flowable Fill" for alternative fill materials.
 - 6. Section 330505.31 "Hydrostatic Testing" for sanitary sewer pipe testing.
 - 7. Section 331413 "Public Water Utility Distribution Piping" for potable-water pipe testing.
 - 8. Section 331416 "Site Water Utility Distribution Piping" for potable-water pipe testing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Convene minimum one week prior to commencing Work of this Section at Project site.

1.3 SUBMITTALS

- A. Product Data: Horizontal directional drilling equipment.
- B. Shop Drawings:
 - 1. Submit technical data for equipment, method of installation, and proposed sequence of construction.
 - 2. Include information pertaining to pits, dewatering, method of spoils removal, and equipment size, capacity, and capabilities, including installing pipe on radius, type of drill bit, drilling fluid, method of monitoring line and grade, detection of surface movement, name plate data for drilling equipment, and mobile spoils removal unit.
 - 3. Signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Qualifications Statement: For driller.
- D. Submit State or Municipality Public Works occupancy permit for installations along or under public thoroughways and lands.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of pipe and invert elevations.

- B. Record actual depth of pipe at 25 foot intervals.
- C. Record actual horizontal location of installed pipe.
- D. Show depth and location of abandoned bores.
- E. Record depth and location of drill bits and drill stems not removed from bore.

1.5 QUALITY ASSURANCE

- A. Driller Qualifications: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Handling:
 - 1. Use shipping braces between layers of stacked pipe.
 - 2. Support pipes with nylon slings during handling.
- C. Storage:
 - 1. According to manufacturer instructions.
 - 2. Stack piping lengths no more than three layers high.
 - 3. Store field joint materials in original shipping containers in dry area indoors.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Protect pipe from entry of foreign materials and water by installing temporary covers, completing sections of Work, and isolating parts of completed system.
 - 3. Provide additional protection according to manufacturer instructions.

1.7 FIELD CONDITIONS

- A. Maintain storage temperature of 60 to 85 degrees F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the Municipality Department of Public Works standards.

2.2 HORIZONTAL DIRECTIONAL DRILLING

A. Performance and Design Criteria:

1. Drilling Steering System: Remote with continuous electronic monitoring of boring depth and location.
2. Directional Change Capability: 90 degrees with 35-foot radius curve.
3. Minimum distance for single bores and between boring pits:
 - a. Pipe Size 1 to 1-1/2 Inches (25 to 38 mm): 400 feet.
 - b. Pipe Size 2 to 2-1/2 Inches (50 to 60 mm): 350 feet.
 - c. Pipe Size 3 to 6 Inches (75 to 150 mm): 300 feet.
4. Ratio of Reaming Diameter to Pipe OD:
 - a. Nominal Pipe Diameter of 6 Inches (150 mm) and Smaller: Maximum of 1.5.
 - b. Nominal Pipe Diameter Larger Than 6 Inches (150 mm): Submit recommended ratio and reaming procedures for review by Architect/Engineer.

B. Water Source:

1. Potable.
2. Obtained from utility source.

C. Drilling Fluid: Liquid bentonite clay slurry; totally inert with no environmental risk.

D. PVC Piping:

1. Pipe: AWWA C900, SDR 18. Blue or white (with blue lettering) coloring.
2. Fittings: AWWA (350 psi) C-110 standard body or AWWA (350 psi) C-153 compact body. Cement lined.

E. Polyethylene (PE) Plastic Pipe:

1. Pipe: PE 3408, SDR 11.
2. 3/4" to 2" Pipe: PE 3408, SDR 9.
3. Fittings:
 - a. Transition with Manufacturer approved butt fused adapter.
 - b. PE Services: Inserts Required and Glued fittings are not approved. Brass Compression: AWWA C-800. Ford or approved equal.

F. Subsoil Fill: Type S1, as specified in Section 310513 "Soils for Earthwork"; excavated and reused soil with no clumps, frozen earth, or foreign matter.

2.3 MIXES

- A. Grout: As specified in Section 036000 "Grouting."
- B. Flowable Fill: As specified in Section 312323.33 "Flowable Fill."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that connections to existing piping system, sizes, locations, and invert elevations are according to Drawings.

3.2 PREPARATION

- A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- B. Local Utility:
 - 1. Call local utility line information service at 811 not less than three working days before performing Work.
 - 2. Request underground utilities to be located and marked within and surrounding construction areas.
 - 3. Request utility company to remove or relocate utilities.
- C. Maintain access to existing services as indicated to remain; modify pipe installation indicated on Drawings to maintain access to existing facilities.
- D. Locate and identify utilities indicated to remain and protect from damage.
- E. Identify required lines, levels, contours, and data locations.
- F. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- G. Protect benchmarks such as existing structures, fences, sidewalks, paving curbs and survey control points from excavating equipment and vehicular traffic.
- H. Maintain a minimum cover for pipes eight (8") inches or less in diameter at 36" and for pipes ten (10") or greater at 48", except where required to meet existing water lines.
- I. Provide minimum 6 feet horizontal clearance between water mains and sewer lines running parallel and minimum 18 inch vertical clearance at crossings.

3.3 INSTALLATION OF HORIZONTAL DIRECTIONAL DRILLING

A. Dewatering:

1. Intercept and divert surface drainage, precipitation, and ground water away from excavation using dikes, curb walls, ditches, pipes, sumps, or other approved means.
2. Develop and maintain substantially dry subgrade during drilling and pipe installation.
3. Comply with State or Municipality of requirements for discharging water to watercourse, preventing stream degradation, and controlling erosion and sediment.

B. Excavation:

1. Excavate subsoil as specified in Section 312316 "Excavation".
2. Excavate approach trenches and pits according to Shop Drawings or as Site conditions require; minimize number of access pits.
3. Provide sump areas to contain drilling fluids.
4. Install excavation supports as specified in Section 312316 "Excavation".
5. Restore areas after completion of drilling and carrier pipe installation.

C. Drilling:

1. Drill pilot bore with vertical and horizontal alignment as indicated on Shop Drawings.
2. Surveying:
 - a. Survey entire drill path and mark entry and exit locations with stakes.
 - b. If a magnetic guidance system is used, survey drill path for surface geomagnetic variations or anomalies.
3. Guiding:
 - a. Guide drill remotely from ground surface to maintain alignment by monitoring signals transmitted from drill bit.
 - b. Monitor depth, pitch, and position.
 - c. Adjust drill head orientation to maintain correct alignment.
4. Drilling Fluid:
 - a. Inject drilling fluid into bore to stabilize hole, remove cuttings, and lubricate drill bit and pipe.
 - b. Continuously monitor drilling fluid pumping rate, pressure, viscosity, and density while drilling pilot bore, back reaming, and installing pipe to ensure adequate removal of soil cuttings and stabilization of bore.
 - c. Provide relief holes when required to relieve excess pressure.
 - d. Minimize heaving during pullback.
5. Verification of Accuracy:
 - a. Calibrate and verify electronic monitor accuracy during first 50 feet of bore in presence of Architect/Engineer before proceeding with other drilling.
 - b. Excavate minimum of four test pits spaced along first 50 feet of bore to verify required accuracy.

- c. If required accuracy is not met, adjust equipment or provide new equipment capable of meeting required accuracy.
6. After completing pilot bore, remove drill bit.
- D. Drilling Obstructions:
 1. If obstructions are encountered during drilling, notify Architect/Engineer immediately.
 2. Do not proceed around obstruction without approval of Architect/Engineer.
 3. For conditions requiring more than 3 feet of deviation in horizontal alignment, submit revised Shop Drawings to Architect/Engineer for approval before resuming Work.
 4. Maintain adjusted bore alignment within easement or right-of-way.
- E. Piping:
 1. Install reamer and pipe pulling head; select reamer with minimum bore diameter required for pipe installation.
 2. Attach pipe to pipe pulling head and pull reamer and pipe to entry pit along pilot bore.
 3. Inject drilling fluid through reamer to stabilize bore and lubricate pipe.
 4. Install piping with horizontal and vertical alignment as shown on Shop Drawings.
 5. Protect and support pipe being pulled into bore such that pipe moves freely and is not damaged during installation.
 6. Do not exceed pipe manufacturer's recommended pullback forces.
 7. Trace Wire:
 - a. Install trace wire continuous with each bore.
 - b. Splice trace wire only at intermediate bore pits.
 - c. Tape or insulate trace wire to prevent corrosion and maintain integrity of pipe detection.
 - d. Terminate trace wire for each pipe run at structures along pipe system.
 - e. Provide extra length of trace wire at each structure such that trace wire can be pulled 3 feet out top of structure for connection to detection equipment.
 - f. Test trace wire for continuity for each bore before acceptance.
 8. Provide sufficient length of pipe to extend past termination point to allow connection to other pipe sections.
 9. Allow minimum of 24 hours for stabilization after installing pipe before making connections to pipe.
 10. Mark location and depth of bore with spray paint on paved surfaces and on wooden stakes on non-paved surfaces at 25-foot intervals.
- F. Slurry Removal and Disposal:
 1. Contain excess drilling fluids at entry and exit points until recycled or removed from Site; provide recovery system to remove drilling spoils from access pits.
 2. Drilling Spoils:
 - a. Remove, transport, and legally dispose of drilling spoils.
 - b. Do not discharge drilling spoils in sanitary sewers, storm sewers, or other drainage systems.

- c. When drilling in suspected contaminated soil, test drilling fluid for contamination before disposal.
 - 3. If drilling fluid leaks to surface, immediately contain leak and barricade area from vehicular and pedestrian travel before resuming drilling operations.
 - 4. Complete cleanup of drilling fluid at end of each working day.
- G. Backfilling:
- 1. Install backfill as specified in Section 312323 "Fill".
 - 2. Backfill approach trenches and pits with subsoil fill to contours and elevations as indicated on Drawings or of surrounding existing grade.
 - 3. Compact subsoil fill as specified in Section 312323 "Fill" to minimum 95 percent of maximum density.

3.4 TOLERANCES

- A. Maximum Variation from Horizontal Position: 12 inches.
- B. Maximum Variation from Vertical Elevation: 2 inches.
- C. Minimum Horizontal and Vertical Clearance from Other Utilities: 12 inches.
- D. Deviation:
 - 1. If pipe installation deviates beyond specified tolerances, abandon bore, remove installed pipe, rebore, and reinstall pipe in correct alignment.
 - 2. Fill abandoned bores greater than 3 inches in diameter with grout or flowable fill material.

3.5 FIELD QUALITY CONTROL

- A. Upon completion of pipe installation, test pipe according to following:
 - 1. Sanitary Sewer Pipe Testing: As specified in Section 330505.31 "Hydrostatic Testing".
 - 2. Water Distribution Pipe Testing: As specified in Section 331413 "Public Water Utility Distribution Piping" or 331416 "Site Water Utility Distribution Piping".
 - 3. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- B. Compaction Testing:
 - 1. Comply with ASTM D698.
 - 2. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
 - 3. Testing Frequency: One for each lift.
- C. Certify that equipment for drilling has been properly set up and is ready for drilling.

3.6 CLEANING

- A. Upon completion of drilling and pipe installation, remove drilling spoils, debris, and unacceptable material from approach trenches and pits.
- B. Clean up excess slurry from ground.
- C. Restore approach trenches and pits to original condition.
- D. Remove temporary facilities for drilling operations as specified.

END OF SECTION 330507.13

SECTION 330597 - IDENTIFICATION AND SIGNAGE FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Utility markers.
2. Marking flags.
3. Ribbon tape.
4. Trace wire.

B. Related Requirements:

1. Section 312316.13 "Trenching" for backfilling considerations for installation of underground pipe markers.
2. Section 312323 "Fill" for backfilling considerations for installation of underground pipe markers.
3. Section 331413 "Public Water Utility Distribution Piping" for piping, valves, and appurtenances requiring identification marking.
4. Section 331416 "Site Water Utility Distribution Piping" for piping, valves, and appurtenances requiring identification marking.
5. Section 333100 "Sanitary Sewerage Piping" for piping, valves, and appurtenances requiring identification marking.
6. Section 333111 "Public Sanitary Sewerage Gravity Piping" for piping, valves, and appurtenances requiring identification marking.
7. Section 333123 "Sanitary Sewerage Force Main Piping" for pipe, valves, and appurtenances requiring identification marking.
8. Section 333126 "Sanitary Pressure Sewer Piping" for pipe, valves, and appurtenances requiring identification marking.
9. Section 334200 "Stormwater Conveyance" for piping, valves, and appurtenances requiring identification marking.

1.2 SUBMITTALS

A. Product Data:

1. Utility markers.
2. Marking flags.
3. Ribbon tape.
4. Trace wire.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of tagged valves.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

PART 2 - PRODUCTS

2.1 UTILITY MARKERS

- A. Manufacturer: Berntsen International Inc.
- B. Description: As required by utility supplier or shown on drawings.

2.2 MARKING FLAGS

- A. Manufacturer: Berntsen International Inc.
- B. Description: As required by utility supplier or shown on drawings.

2.3 RIBBON TAPE

- A. Manufacturers:
 - 1. Berntsen International Inc.
 - 2. Pipemarker.com; Brimar Industries, Inc.
- B. Description:
 - 1. Material: Nonmetallic.
 - 2. Water Mains: Brightly blue colored, continuously printed.
 - 3. Minimum Size: 3 inches wide.
 - 4. Manufactured for direct burial service.

2.4 TRACE WIRE

- A. Manufacturers:
 - 1. Northtown Company.
 - 2. Priority Wire and Cable, Inc.
 - 3. Conductor: Magnetically detectable.
 - 4. Wire: Unshielded 14-gage Type THW insulated copper.

PART 3 - EXECUTION

3.1 INSTALLATION OF IDENTIFICATION AND SIGNAGE FOR UTILITIES

- A. Utility Markers and Marking Flags: According to utility supplier, shown on drawings and manufacturer instructions.
- B. Trace Wire:
 - 1. The tracer wire shall be placed over the center of PVC and PE pipe for the entire length including crossings.
 - 2. Attach wire to all fixtures and appurtenances to ensure continuous flow of electrical current.
 - 3. Splices in detection wire shall be installed in a direct bury splice kit manufactured by 3M or approved equal.
- C. Ribbon Tape:
 - 1. All PVC pipe shall be marked using a nonmetallic tape buried at least 15 inches above the top of the pipe. After the tracer wire has been placed, the pipe trench shall be backfilled to approximately 15 inches over the top of the pipe then the nonmetallic tape shall be placed flat over top of pipe within trench. Backfill shall be carefully placed to a depth of 3 inches by hand to assure that the tape is secured in place over the pipe. It is the intent to provide a visible marker in the event of excavation near a water line.

END OF SECTION 330597

SECTION 331416 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping.

B. Related Requirements:

1. Section 221100 "Facility Water Distribution" for product and execution requirements for domestic water piping at building.
2. Section 310513 "Soils for Earthwork" for soils for backfill in trenches.
3. Section 310516 "Aggregates for Earthwork" for aggregate for backfill in trenches.
4. Section 312316 "Excavation" for product and execution requirements for excavation and backfill.
5. Section 312316.13 "Trenching" for execution requirements for trenching.
6. Section 312323 "Fill" for requirements for backfill to be placed by this Section.
7. Section 330110.58 "Disinfection of Water Utility Piping Systems" for disinfection of water mains and appurtenances.
8. Section 330597 "Identification and Signage for Utilities" for pipe markers.
9. Section 331417 "Site Water Service Utility Laterals" for water main service connections.
10. Section 331419 "Valves and Hydrants for Water Utility Service" for fire hydrants, valves, and valve boxes for fire hydrant and water main installations.
11. Section 331900 "Water Utility Metering Equipment" for positive displacement meters as required by this Section.

1.2 REFERENCES

- A. ANSI/ASTM D 1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds.
- B. ANSI/ASTM D 2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- C. ANSI/AWWA C104/A21.4 Cement Mortar Lining for Ductile-Iron Pipe and Fittings.
- D. ANSI/AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In.
- E. ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
- F. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe.
- G. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe for Water or Other Liquids.
- H. AWWA C651 Disinfecting Water Mains.
- I. AWWA C900 Poly (Vinyl Chloride) (PVC) Pressure Pipe 4 In. through 12 In.

- J. AWWA C605 Underground Installation of PVC Pressure Pipe & Fittings for Water.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Piping.
 - 2. Reduced-pressure backflow preventers.
- B. Field Quality-Control Reports: For piping and related equipment.
- C. Qualifications Statements: For installer.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Installers Qualifications: Company specializing in performing Work of this Section with minimum three years' experience in installation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Block individual and stockpiled pipe lengths to prevent moving.
 - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
 - 4. Store PE and PVC materials out of sunlight.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the State of Louisiana Department of Health and conform to applicable state and local codes for installation and testing of the work in this section.
- B. All products must conform to the state regulations (Act 362) requiring low lead in water distribution systems. Submittals on all products to be used shall be provided to the owner for review and approval prior to installation.

2.2 WATER MAIN PIPING

- A. PVC Pipe (2 Inch):
 - 1. Pipe and fittings shall be made from clean, virgin NSF approved Type I, Grade I PVC conforming to ASTM Resin Specification D1784-65T.
 - 2. PVC pipe shall be supplied in standard nominal laying lengths of 20 feet. The color of pipe shall be blue or white with blue lettering. The pipe shall be marked with the size, material code, dimension ratio (DR), AWWA pressure class and AWWA designation.
 - 3. Pipe shall meet ASTM D2241 pipe standards working pressure of 160 psi, SDR 26, Commercial Standard C5256-63, and be approved by the National Sanitation Foundation.
 - 4. Fittings shall be brass, compression type.
 - 5. No 2-inch PVC pipe joint will be allowed in roadway.
- B. PVC Pipe (Above 2 Inch):
 - 1. Pipe:
 - a. 4 - 12 inch: AWWA C900, SDR 18, 235 psi pressure, NSF approved, 12454 PVC compound conforming to ASTM Resin Specification D1784.
 - b. 14 - 24 inch: AWWA C905, SDR18 DIPS, 235 psi rating, NSF approved, 12454 PVC compound conforming to ASTM Resin Specification D1784.
 - 2. Provide pipe which is homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties.
 - 3. Fittings shall be ductile iron.
 - 4. Joints shall be made of gasket bell push-on type. Joints shall be gasket joints conforming to ASTM F477. Joints assembled with non-toxic lubricant.
 - 5. All joints under roadways shall be restrained.
 - 6. PVC pipe shall be supplied in standard nominal laying lengths of 20 feet. The color of pipe shall be blue or white with blue lettering. The pipe shall be marked with the size, material code, dimension ratio (DR), AWWA pressure class and AWWA designation.
 - 7. Fusion-joined PVC pipe shall be Fusible C-900 (3 to 12-inch) and Fusible C-905 (14 to 24-inch) with the same properties (SDR, coloring, labeling, etc.) as stated above. The chemical compounds for fusion-joined PVC pipe shall be formulated to facilitate the thermal-fusion process.
 - 8. Fusion-joined PVC shall be joined by a pipe manufacturer-certified technician with manufacturer approved equipment and shall include a means of logging fusion process data.
- C. Ductile Iron Water Pipe:

Pipe shall be designed in accordance with ANSI Specification A21.50 (AWWA C150), latest revision. All pipe shall be designed for the following minimum conditions, unless noted otherwise:

1. Internal working pressure of 250 psi plus 100 psi surge allowance plus safety factor of 2.
2. Earth load of 5 feet of cover or as shown on the plans.
3. Laying Condition Type 2.
4. AASHTO H-20, truck loading.

Pipe shall be manufactured in accordance with ANSI Specification A21.51 (AWWA C151), latest revision, except the minimum nominal wall thickness shall be as shown on the following table:

<u>Size</u>	<u>Pressure Class</u>	<u>Thickness</u>
6"	350	0.25
8"	350	0.25
10"	350	0.26
12"	350	0.28
14"	250	0.28
16"	250	0.30
18"	250	0.31
20"	250	0.33
24"	250	0.37
30"	250	0.42

Pipe shall be standard cement lined and seal coated on the inside with a bituminous coat in accordance with ANSI Specification A21.4 (AWWA C104), latest revision. The exterior of the pipe shall be coated, with an asphaltic coating approximately 1 mil thick in accordance with ANSI Specification A21.51 (AWWA C151), latest revision. Ductile iron pipe shall be as manufactured by American Cast Iron Pipe Company, Clow Corporation, U.S. Pipe and Foundry Company, or approved equal.

Joints shall be push-on, conforming to ANSI Specification A21.11 (AWWA C111), latest revision, unless noted otherwise. Push-on joints shall be equal to push-on joints manufactured by American Cast Iron Company, U.S. Pipe and Foundry Company, or approved equal.

All pipe is to be hydrostatically proof tested to a minimum of 75% yield strength after manufacture. The manufacturer will furnish the Owner sworn certificates that pipe has been manufactured, tested and inspected in accordance with applicable specifications.

D. Ductile Iron Restrained Joint Pipe:

Restrained joint pipe shall be ductile iron pipe designed and manufactured in accordance with Ductile Iron Pipe Section, of this article. Restrained joint fittings and the restraining components shall be ductile iron in accordance with the applicable requirements of ANSI/AWWA C110/A21.10, C111/A21.11 and C153/A21.53.

Restrained joint pipe and fittings for 12 inch and smaller diameter pipe shall be "Flex-Ring" by American Cast Iron Pipe Company, "TR-Flex" by U.S. Pipe and Foundry Company, "Super-Lock" by Clow Corporation, or approved equal. Restrained joint pipe and fittings for 14 inch and larger diameter pipe shall be "Lok-Ring" by American Cast Iron Pipe Company, "TR-Flex"

by U.S. Pipe and Foundry Company, “Super-Lock” by Clow Corporation, or approved equal. Fittings for use with restrained joint pipe shall be ductile iron and shall conform to ANSI/AWWA C110/A21.10 and C153/A21.53. Where bolts are required, they shall be corrosion resistant. Field cut restrained joints shall be installed in accordance with the manufacturer’s recommendations.

E. Fittings:

Ductile Iron: Ductile iron fittings shall be standard body ANSI A21.10/AWWA C110 or compact body ANSI A21.53/AWWA C153. The rated working pressure shall be 350 psi. Sufficient quantities of gaskets, glands, bolts and nuts shall be furnished to provide for each socket opening. Bolts and nuts shall be alloy steel (Corten Type). All fittings shall be asphalt coated outside and cement lined and seal coated inside in accordance with ANSI A21.4/AWWA C104. Fittings must be manufactured in the United States.

F. Polyethylene Pipe (PE Pipe):

1. Pipe: AWWA C906, SDR11, PE 3408 High Density, DIPS, Cell Classification 345434C, in accordance with ASTM D3350 (Black with Blue Stripes).
2. Transition Fittings shall be a mechanical joint adapter (Harvey Adapter) fabricated from HDPE pipe conforming to ASTM 3350. The fitting shall have a pre-positioned stiffener and shall offer full axial restraint.

G. Casing:

1. Casing shall be welded smooth steel pipe conforming to APL 5L, Grade B or ASA B36.10, coated inside and outside with asphalt or painted with two coats of bitumastic paint.
2. Minimum thickness of 0.375 inches is required.
3. Spacers shall be provided at manufacturer’s recommended increments.

H. Polyethylene Encasement:

1. Polyethylene wrap is to be used in open-cut construction for ductile iron pipe when a cathodic protection system is required.
2. Polyethylene encasement shall conform to AWWA C105.
3. Film shall be Class C-Black, minimum thickness of 0.008 inches (8 mils), and furnish a certificate of conformance of the material to the requirement of AWWA C105.
4. Tape shall have a pressure sensitive adhesive face capable of bonding to metal, bituminous coating, and polyethylene, minimum thickness of 8 mils, and a minimum width of 3 inches.

I. Detection Wire:

1. A THW 14 insulated solid copper wire shall be placed over the center of PVC and PE pipe for the entire length including crossings.
2. Attach wire to all fixtures and appurtenances to ensure continuous flow of electrical current.
3. Splices in detection wire shall be installed in a direct bury splice kit manufactured by 3M or approved equal.
4. Detection wire and splice kit is to be included in unit price for either PVC or PE pipe.

J. Retainer Glands:

1. Retainer glands and bell joint restraints shall be of the following manufacturer or approved equal:

Retainer Glands – UFR 1400 Ford or EBBA Megalug for Ductile Iron Pipe

Retainer Glands – UFR 1500 Ford or EBBA Megalug for PVC Pipe

Bell Joint Restraints – UFR 1390 Ford or EBBA Megalug for PVC and Ductile Iron Pipe

K. Marking Tape

All PVC pipe shall be marked using a nonmetallic tape buried at least 15 inches above the top of the pipe. Water mains shall be marked with blue tape. Tape shall be 3 inches wide minimum and on the Board's list of materials and approved manufacturers. After the tracer wire has been placed, the pipe trench shall be backfilled to approximately 15 inches over the top of the pipe then the nonmetallic tape shall be placed flat over top of pipe within trench. Backfill shall be carefully placed to a depth of 3 inches by hand to assure that the tape is secured in place over the pipe. It is the intent to provide a visible marker in the event of excavation near a water line.

2.3 ACCESSORIES

- A. Pipe Markers: As specified in Section 330597 "Identification and Signage for Utilities."
- B. Vaults: As specified in Section 330563 "Concrete Vaults and Chambers."
- C. Metering Equipment: As specified in Section 331900 "Water Utility Metering Equipment."
- D. Meter Boxes: As specified in Section 330577 "Fiberglass Metering Manholes".
- E. Steel Rods, Bolt, Lugs, and Brackets:
 - 1. Comply with ASTM A36/A36M or A307.
 - 2. Grade A carbon steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for site water utility distribution piping to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.

- C. Prepare pipe connections to equipment with flanges or unions.
- D. Provide minimum 6 feet horizontal clearance between water mains and sewer lines running parallel and minimum 18 inch vertical clearance at crossings.
- E. Protect and support existing distribution piping and appurtenances as Work progresses.

3.3 TRENCHING

- A. Maintain a minimum cover for pipes 8-inches or less in diameter at 36-inches and for pipes 10-inch or greater at 48-inches, except where required to meet existing water lines.
- B. The bottom of the trench shall be excavated to a uniform grade and shall be free from obstructions, which would result in the weight of the pipe being concentrated at certain points.
- C. Where subsurface obstructions are encountered in the trenching operations, the Contractor will be permitted to lay pipe above the obstruction if the minimum cover required can be obtained while providing at least 3-inches thick clearance between the bottom of the pipe and the top of the obstruction.
- D. Where the 6-inch minimum cover cannot be obtained above an obstruction, the Contractor will be required to lay the pipe under the obstruction. No additional compensation for additional depth of bury will be paid for constructing the line in this manner.
- E. Maximum length of trench to be opened in advance of a section of completed water main shall be 200 feet.
- F. The Engineer shall at his discretion limit the maximum length of trench opened in advance of the completed main.
- G. The Contractor will be required to keep the sides of the trench as nearly vertical as possible by means of sheathing or bracing, as may be required to thoroughly support the sides of the excavation.
- H. If sheathing is used, the bottom width of the trench in the clear shall be 12-inches wider than the greatest horizontal diameter of the water pipe. Unless otherwise ordered by the Engineer, that portion of sheathing in the trench extending below the top of the water main shall not be withdrawn before more than 6-inches of earth is placed above the top of the main. If the sheathing cannot be removed without injury to the water main or to the adjoining structures, it shall be left in place, or it shall be cut where directed and the upper part shall be removed.
- I. Excavated material shall be placed in such a manner that will not endanger the work or prevent obstruction of sidewalks or driveways. No street shall be closed to through traffic without the permission of the Engineer.
- J. The Contractor shall take every precaution to protect existing structures and landscaping.
- K. The Contractor shall give sufficient notice to the interested utility of his intention to remove or disturb any other pipe or conduit and shall abide by their regulations governing such work.

- L. During construction operations the Contractor shall make all provisions to not disturb existing piping or conduit systems. If any existing systems are damaged, the Contractor shall be responsible for any and all repairs to the satisfaction of the Engineer.
- M. If during construction operations a utility service line is broken, the Contractor shall repair the line at his own expense, or if preferred by the utility involved, shall pay the utility for utilizing their own forces. Delays for extended periods will not be tolerated, thus the Owner reserves the right to make repairs at the Contractor's expense without prior notification.
- N. Mains shall be jack or bored under all concrete roadways and sidewalks except where specified or in special cases where no other practical method for installation is available. In the event the concrete surface is damaged during construction operations, repairs to the pavement shall be made by the Contractor at no additional cost to the Owner.

3.4 DEWATERING

- A. The Contractor shall furnish all equipment necessary for pumping water accumulated in the trenches.
- B. Trenches and other excavations shall be kept clear of water while pipe is being installed or concrete structures are being constructed.
- C. No pipe or appurtenances shall be laid in water.

3.5 PIPE INSTALLATION

- A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.
- B. Where, in the opinion of the Engineer, the floor of the trench is not sufficiently stable to prevent vertical or lateral movement of the pipe after installation, the pipe shall be laid on a timber foundation or the trench shall be excavated below grade and brought back to grade with suitable filling of limestone or select fill material, as directed.
- C. Immediately prior to placement of embedment materials, the bottoms and sidewalls of trenches shall be free of loose or unsuitable soil.
- D. Thoroughly clean interior of pipe before lowering into the trench while keeping pipe interior free of foreign matter during laying operations.
- E. When work is not in progress, the ends of the pipe and fittings shall be sealed so foreign material cannot enter pipe.
- F. The pipe shall be installed and backfilled in accordance with the manufacturer's specifications. Items of work not mentioned specifically herein shall be performed in compliance with the current revision of AWWA C605, "Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water."

- G. Pipe laying operations shall not block, obstruct, or prevent streams, ditches, canals, culverts, conduits, or gutters from carrying their normal flows or of serving their normal function without the approval of the Engineer. Any disruption shall be restored by the Contractor.
- H. The trench shall provide continuous support for the pipe without voids or soft spots under the pipe.
- I. Concrete thrust blocks shall be provided at all fittings where a change of direction occurs or as specified by the Engineer for all pipe 3-inch diameter or greater. Thrust blocks shall be poured against undisturbed soil and shall not cover the bolts or nuts on the fittings. A plastic barrier shall protect bolts or nuts from being covered.
- J. Every change in direction where a fitting or mechanical joint is used shall have three (3) forms of restraint within two (2) whole joints of the fitting. Restraints required are as such mega lugs, thrust blocks, dead man, bell joint restrainers, locking joint, all threaded rods or approved by Engineer.
- K. The water main shall be installed in steel casing where indicated in the Drawings, typically under state highways, railroads, or as indicated by the Engineer.
- L. Pipe shall be laid beneath all ditches, sewers, culverts, pipes, conduits, drainage canals, tracks and similar structures. Regular pipe laying methods shall be used in all such cases except where special crossings are indicated.
- M. The Contractor shall not operate any valves that will allow water to flow or stop the flow of water. These valves will be operated by the Municipality system personnel **only**.
- N. Water service to customers shall be maintained without interruption as much as possible. Interruption of service shall be allowed only at times agreed to by the Owner and with proper notice to the customer (at least one hour in advance).
- O. The Owner may require that major connections which require lengthy interruptions to service be made during periods of low water use or that temporary service lines be provided by the Contractor at no additional cost to the Owner.
- P. Assembly of fittings and other preparatory work shall be done in advance to reduce the off time and to keep interruption to a minimum.

3.6 BACKFILLING OF TRENCH

- A. Perform backfill operations and restore surface as soon as practicable. Leave only the minimum length of trench open as necessary for construction.
- B. Re-excavation of the trench for replacement of pipe, tapping, testing, or disinfecting shall be done by the Contractor at no additional cost to the Owner.
- C. The Owner reserves the right to order any trench or trenches backfilled at any time after installation of pipe if the particular trench remaining open constitutes a public nuisance.
- D. Outside of Public Right-of-Ways:

1. Compact excavated material around and to a depth of 12-inch above the pipe for the entire length of the trench to 90-percent of maximum standard proctor density in 6 to 8-inch lifts.
2. The remaining portion of the trench shall be backfilled in 12-inch lifts and thoroughly compacted leaving a slightly crowned condition, not to exceed 12-inch above natural ground.

E. Inside of Public Right-of-Ways:

Outside of Public Roadways:

1. Compact excavated material around and to a depth of 12-inch above the pipe for the entire length of the trench to 95 percent of maximum standard proctor density in 6 to 8-inch lifts.
2. The remaining portion of the trench shall be backfilled in 12-inch lifts and thoroughly compacted leaving a slightly crowned condition, not to exceed 12-inch above natural ground.

Underneath roadways, streets, shoulders, walks, and drives (as per details in the drawings):

1. Limestone shall be compacted in 12-inch lifts to 95-percent density up to 3-inch (min.) – 12-inch (max.) above pipe.
2. A mechanical vibrator shall be used to compact the limestone.
3. The remainder of the trench shall be filled with flowable fill.

- F. All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, and lots. Salvaging and replacement of sod on lawns may be ordered by the Engineer at no additional cost to the Owner. All surplus excavated material shall be removed by the Contractor, and shall be disposed of at locations and in a manner approved by the Engineer.

3.7 FLUSHING OF WATER MAIN

- A. As-built information shall be provided to Engineer personnel prior to any flushing and testing.
- B. The flushing process shall be performed in the presence of Municipality and Owner Representative. The Contractor shall notify personnel at least 48 hours prior to flushing of the water mains.
- C. All water mains shall be flushed before testing and sampling of the water system.
- D. Provide properly sized riser pipes for flushing when hydrant outlets are not convenient. The municipality personnel shall approve size of riser pipes for flushing.
- E. The duration of the flushing shall be determined in the field by the Engineer.
- F. The size of the flushing outlet shall be as shown below:

<u>Water Main Size</u>	<u>Size of Flushing Outlet</u>
2"	2" Riser
4"	2" Riser
6"	One 4½" Hydrant Pumper Outlet or One 6" Riser
8"	One 4½" Hydrant Pumper Outlet or One 6" Riser

10"	One 6" Riser
12"	One 8" Riser
16"	One 12" Riser

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

3.9 HYDROSTATIC TESTING OF MAINS

- A. The Contractor shall furnish all materials, equipment, and labor to satisfactorily test the pipe at no cost to Owner.
- B. The Owner shall supply water for testing purposes.
- C. The water mains shall be pressured to 150 psi and shall hold that pressure for two (2) hours.

3.10 DISINFECTION OF WATER LINES

- A. As specified in Section 330110.58 "Disinfection of Water Utility Piping Systems."

3.11 CLEAN UP

- A. Remove from the site all tools, equipment, temporary structures and surplus materials.
- B. Dispose of all excess soil, waste, rubbish, debris or objectionable materials off the site and in a manner and a location that complies with local ordinances and laws and is acceptable to all parties concerned and is approved by the Engineer.
- C. When disposal of excess soil is upon private lands, the Contractor shall be required to produce a written agreement with the private landowner stating the agreed terms and conditions.
- D. The entire construction site shall be left clean and to the satisfaction of the Engineer.

END OF SECTION 331416

SECTION 331419 - VALVES AND HYDRANTS FOR WATER UTILITY SERVICE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Valves.
2. Valve boxes.
3. Fire hydrants.
4. Tapping sleeves and valves.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete for thrust restraints.
2. Section 099000 "Painting and Coating: for exterior finish for fire hydrants.
3. Section 310516 "Aggregates for Earthwork" for fire hydrant drainage gravel.
4. Section 330110.58 "Disinfection of Water Utility Piping Systems" for requirements for flushing and disinfecting.
5. Section 331413 "Public Water Utility Distribution Piping" for pressure testing of valves and hydrants.
6. Section 331416 "Site Water Utility Distribution Piping" for pressure testing of valves and hydrants.
7. Section 331417 "Site Water Service Utility Laterals" for piping, trenching, backfilling, and compaction requirements.

1.2 REFERENCE STANDARDS

A. American Water Works Association:

1. AWWA C502 Dry-Barrel Fire Hydrants.
2. AWWA C509 or C515 Resilient-Seated Gate Valves for Water and Sewerage Systems.
3. AWWA C700 Cold Water Meters – Displacement Type.
4. AWWA C800 Underground Service Line Valves and Fittings.
5. AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing.

1.3 COORDINATION

- A. Coordinate Work of this Section with installation of water mains.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Product Data:

1. Valves.
2. Fire hydrants.
3. Valve boxes.

B. Source Quality-Control Reports: For valves, valve boxes, and fire hydrants.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves and hydrants.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Tools: Furnish one tee wrench of required length to Owner.

1.8 QUALITY ASSURANCE

A. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.

B. Submit a certificate of compliance from the manufacturer stating product meets standards as set forth in these specifications.

C. Cast manufacturer's name, pressure rating, and year of fabrication into valve body.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Seal valve and hydrant ends to prevent entry of foreign matter.
2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the State of Louisiana Department of Transportation and the Municipality Department of Public Works standards.

2.2 FIRE HYDRANTS

- A. Manufacturers:
 - 1. Mueller A-423 "Centurion"
 - 2. M & H Dresser 929 "Reliant" or 129
 - 3. Kennedy K-81 "Guardian"
 - 4. Clow F2545 Medallion
 - 5. American B-84-B
- B. The fire hydrant shall conform to AWWA Standards C 502-94 or updated revisions thereof for improved type three-way dry barrel type hydrants. All hydrants must be UL and FM approved.
- C. Features:
 - 1. Operating nut must be:
 - a. Bronze.
 - b. Non-rising, pentagonal in shape, measuring 1-1/2" from point to flat.
 - 2. Hold-down nut must:
 - a. Incorporate an integral resilient weather seal.
 - b. Must be: counterclockwise.
 - 3. Lubrication chamber must be provided:
 - a. Sealed top and bottom with "O" rings.
 - b. Filled with lubricant which shall be either oil or grease.
 - c. The design shall be such that the thrust collar and the threaded operating parts are automatically lubricated each time the hydrant is cycled.
 - d. There must not be less than two (2) "O" rings separating the lubrications reservoir from the waterway and that portion of the stem contracting these "O" rings shall be sleeved with bronze.
 - e. An anti-friction device must be in place above the thrust collar to further minimize operating torque.
 - 4. Hydrants bonnet – must be attached to the upper barrel by not less than four (4) bolts and nuts, with an inserted flat rubber gasket as a pressure seal.
 - 5. Hydrants must be:
 - a. "Three-way", having two (2) 2-1/2" hose nozzles with National Standards Threads and one (1) pumper nozzle measuring 4-1/2" I.D. with National Standard Thread.
 - b. Nozzles must attach counterclockwise into hydrant barrel utilizing "O" ring pressure seals.
 - c. A suitable nozzle lock must be in place to prevent inadvertent nozzle removal.
 - d. "Traffic-model", having upper and lower barrels joined approximately 2" above the ground line by a separated and breakable "swivel" flange providing 360-degree rotation of upper barrel for proper nozzle facing. This flange must employ not less than eight (8) bolts.

- e. Stem must be: two-piece, not less than 1-1/4" diameter or 1" x 1" square (excluding threaded or machined areas) and must be connected by a breakable stem coupling near the ground line flange. Screws, pins, bolts or fasteners used in conjunction with the stem coupling must be stainless steel.
- f. Painted with Yellow Enamel #54-302 PPG or equal on exterior.
- 6. Hydrant shoe and barrel casting must be fabricated of ASTM, A-126, Class B Gray Iron or Ductile Iron ASTM, A1-536, but no combination thereof, assuring uniform strength of all cast components, minimizing the possibility of shoe breakage upon traffic impact. The inside diameter of the hydrant barrel shall not be less than six and one-eighth inches (6-1/8).
- 7. Main valves must be:
 - a. Compression type closing with the pressure and must be not less than 5-1/4" diameter.
 - b. Composition of the main valve must be molded rubber or neoprene, having a durometer hardness of 95 (+) (-) 5 and must be not less than 1" thick.
- 8. Hydrants must be equipped with drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is open.
- 9. Seat ring and drain ring (show bushing) must be:
 - a. Bronze (ASTM B-62) and work in conjunction to form an all-bronze drain way.
 - b. Two (2) drain openings are required and if they are in the cast iron shoe, they must be bronze lined and the bronze seat ring must thread into bronze drain ring (or shoe bushing) providing bronze to bronze connection.
 - c. Seat ring seals must be "O" rings. The 6" shoe connection must be specified (flanged, A/C, M.J., etc.) having ample blocking for sturdy setting and a minimum of eight (8) bolts and nuts is required to fasten the shoe to the lower barrel.
 - d. The interior of the shoe shall have a protective coating of a two-part thermosetting epoxy of at least 4 mils. If a stem cap nut is utilized it must be locked in place by a stainless-steel lock washer or similar non-corrosive device.
- 10. Hydrant must have:
 - a. A working pressure rating of 250 PSIG and be tested at 500 PSIG.
 - b. Have a manufacture warranty against defects in material or workmanship for a period of 5-years from date of manufacture.
- 11. Upon request, supplier must furnish flow data indicating friction loss in PSI at the flow of 1,000 GPM from the pumper nozzle. Such friction loss must not exceed 3 PSI.
- 12. Hydrant bury shall be 3, 4, 5 and 6-feet unless specified in bid form.
- 13. Hydrant extension sections shall be furnished by the same manufacturer as for the hydrant to which section is to be added.
- 14. One 1 hydrant wrench shall be furnished with each 10 hydrants or fraction thereof.
- 15. All nozzle caps shall have extra-long, heavy (no smaller than five (5) gauge) link chains that will not kink. The chain loop at the cap end shall permit free turning of the caps.
- 16. Anchor couplings or swivel hydrant fittings shall be used where indicated on the drawings or where required by the Engineer to tie six (6") inch pipe from the main to the hydrant.
 - a. The 3 types of anchoring fittings available are- anchoring tees, anchoring elbows and anchoring couplings.
 - b. Swivel mechanical joint hydrant fittings shall be made with AWWA Class "D" metal thickness throughout, with applicable dimensions, laying lengths and radii, conforming to AWWA A21.10 and AWWA C-111.
 - c. All anchoring tees shall be 6-inch by 6-inch by 6-inch MJ by MJ by Swivel.
 - d. All anchoring elbows shall be 6-inch by 6-inch Swivel by Swivel 90-degree elbow.

- e. All anchoring couplings shall be 6-inch by 6-inch Swivel by solid adapter 12" long.
- f. Acceptable manufacturers of anchor couplings: Tyler Pipe and Foundry Company, U.S. Pipe and Foundry Company, James B. Clow and Sons or approved equal.

2.3 SERVICE CONNECTIONS

- A. Water Tubing (high density polyethylene): All high density polyethylene plastic tubing shall be SDR 9, Class 200 PSI, PE-3408 (Cell Class 355434-C) and shall conform to ASTM D2737-37, the latest amendment thereof. Stainless steel inserts (liners) are required on all connections to pack joint fittings.
- B. Corporation Stops: All corporation stops used shall conform to AWWA Standard C-800 and shall be Ford No. F-1000 or approved equal and shall be of the size required in the drawings.
- C. Curb Stops: Curb stops shall not be used unless such use is specifically requested and is approved by the Water Division. If required, these shall conform to AWWA Standards and shall be Ford Ball Valves or approved equal and shall be of the size required.
- D. Meter Boxes: Cast iron meter boxes shall be sized by the Water Division and shall be of the following types or approved equal.

<u>SIZE OF CONNECTIONS</u>		<u>METER SIZE</u>	<u>TYPE</u>
<u>INLET</u>	<u>OUTLET</u>		
1"	1"	5/8" X 3/4"	Ford Yokebox No. YL 244-244
1"	1"	1"	Ford No. 4 Yokebox
2"	2"	1-1/2" & 2"	1/4" Cast Iron Box with 1/4" steel floor plate cover (Per Detail)

Meter boxes for meters up to and including 1-inch shall have pack joint fittings on each inlet and outlet connection and shall be coated with a coal tar type paint. Lids shall have "WATER METER" imprinted on them.

- E. Check Valves: All 1-inch services shall use Stockman B-345 or approved equal. Check valves less than 1-inch shall be used when determined by the Water Division or LCG Codes as necessary.
- F. Service Fittings: Brass goods and fittings shall be made of red brass of composition 85-5-5-5. All threads shall be standard in accordance with AWWA Standard C-800 for service fittings.

Pack joints for joining galvanized pipe, K copper and polyethylene plastic tubing PE 3408 shall be Ford Pack Joint Couplings or approved equal.

- G. Customer Shut-Off Valve: The customer shut-off valve shall be a gate valve type, Mueller H 10914, Nibco T-22 or approved equal. Body shall be of waterworks brass, tapped and threaded for iron pipe. Valves shall be a positive stop to prevent flow.
- H. Service Saddle Clamps: The service saddle clamps shall be as called for in the plans and/or bid form.

2.4 VALVE AND VALVE BOXES

- A. Gate valves shall be mechanical joint gate valves (4-inch through 12-inch) having a resilient seat and shall conform to AWWA Specifications C509 or C515 and UL/FM approved.
- B. Design of gate valves 4-inch through 12-inch shall provide non-rising stem (NRS), dual seal between gate and body, smooth closing gate and one piece cast iron wedge with integral lugs. Valve shall be furnished with standard o-ring seals, two o-ring seals shall be set above the stem thrust collar and one below. Direction to open shall be counter-clockwise equivalent to American Flow 2500, M&H 4067-01 or 7571, Clow F6100 (C509 or C515) or Mueller A-2360.
- C. Valves for use with 2-inch pipe shall be AWWA non-rising stem, iron body, resilient seat gate valves, similar to the type specified for larger sizes, except that the joints shall be screwed ends.
- D. Valves larger than 12-inch shall be approved by Engineer.
- E. Valves shall be provided with 2-inch operating nuts marked to indicate the direction of opening. Valves shall open counterclockwise.
- F. Valve boxes for all valves 12-inch in diameter and smaller shall be made of cast iron and shall be of the heavy roadway type with inside diameter of not less than 5-inches. The top section shall be adjustable for elevation. The base shall be sufficiently enlarged so that it will not come in contact with the valve or pipe at any point. All valve boxes shall be provided with covers on which the word "WATER" is printed in raised letters. A pre-cast concrete pad shall be installed for all valve boxes outside pavement.

2.5 TAPPING SLEEVES AND VALVES

- A. The tapping sleeves shall be 304 stainless steel with stainless steel flange, bolts, and nuts as manufactured by Mueller H-304SS, Romac SST, Smith-Blair 663 and Ford FAST.
- B. Mechanical joint type stainless steel tapping sleeves shall be used where indicated on the drawings or where required by the Engineer to make connections to existing four (4") inch and larger water mains.
- C. The tapping valves shall have a resilient seat and shall conform to AWWA Specifications C509 or C515. (Approved manufacturers: Kennedy, Clow, M&H, American Flow, or Mueller)

2.6 CUT-IN SLEEVES AND VALVES

- A. Cut-in valves shall be furnished with mechanical joints and shall installed within a valve box.

- B. Cut-in valves shall be Mueller H-866 or approved equal.
- C. Cut-in sleeves shall be Mueller H-842 or approved equal.

2.7 SOURCE QUALITY CONTROL

- A. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
 - 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Determine exact location and size of valves from Drawings.
- C. Identify required lines, levels, contours, and datum locations.
- D. Verify that elevations of existing facilities prior to excavation and installation of valves and hydrants are as indicated on Drawings.
- E. A minimum of 7 cubic feet of clean washed gravel shall be placed around each hydrant base. Backfill above gravel shall be thoroughly tamped.
- F. Bury hydrants to the point indicated on the barrel. Where necessary and where required by the Engineer, hydrant extension sections shall be installed to adjust the hydrant to grade.
- G. Fire hydrant bury shall be 3-1/2 feet for both 6-inch and 8-inch mains and 4-1/2 feet for 10-inch and above mains.
- H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Locate, identify, and protect from damage utilities to remain.
- B. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
 - 1. Notify Architect/Engineer not less than 7 days in advance of proposed utility interruption.
 - 2. Do not proceed without written permission from Architect/Engineer.

3.3 INSTALLATION OF VALVES AND HYDRANTS

- A. Perform trench excavation, backfilling, and compaction as specified in Section 331417 "Site Water Service Utility Laterals".
- B. Install valves and hydrants in conjunction with pipe laying.
- C. Provide buried valves with valve boxes installed flush with finished grade.
- D. Provide support blocking and drainage gravel while installing fire hydrants; do not block drain hole.
- E. Orientation:
 - 1. Set valves and hydrants plumb.
 - 2. Set fire hydrants with pumper nozzle facing roadway.
 - 3. Set fire hydrants with centerline of pumper nozzle 18 inches above finished grade and with safety flange not more than 6 inches nor less than 2 inches above grade.
- F. After main-line pressure testing, flush fire hydrants and check for proper drainage.
- G. Disinfection of Water Piping System: Flush and disinfect valves and hydrants with water mains as specified in Section 330110.58 "Disinfection of Water Utility Piping Systems."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing: Pressure test valves and hydrants with water mains.
- C. Prepare test and inspection reports.

END OF SECTION 331419

SECTION 333100 - SANITARY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sanitary sewerage piping.
2. Manholes.
3. Flexible couplings.
4. Flexible pipe boots for manhole pipe entrances.

B. Related Requirements:

1. Section 221300 "Facility Sanitary Sewerage" for product and execution requirements for sanitary waste and vent piping at building.
2. Section 310513 "Soils for Earthwork" for soil for backfill in trenches.
3. Section 310516 "Aggregates for Earthwork" for aggregate for backfill in trenches.
4. Section 312316 "Excavation" for requirements for excavation and backfill as required by this Section.
5. Section 312316.13 "Trenching" for requirements for trenching as required by this Section.
6. Section 312323 "Fill" for requirements for backfilling as required by this Section.
7. Section 330561 "Concrete Manholes" for manholes for sanitary sewerage piping.
8. Section 330597 "Identification and Signage for Utilities" for pipe markers.

1.2 DEFINITIONS

- ##### A. Bedding:
- Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.3 COORDINATION

- ##### A. Coordinate Work of this Section with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

1.4 PREINSTALLATION MEETINGS

- ##### A. Preinstallation Conference:
- Conduct conference at Project site.

1.5 SUBMITTALS

- ##### A. Submit product data for pipe, fittings and accessories.

- B. Submit when requested by the Engineer, manufacturer's printed instructions for delivery, storage, preparation, assembly, installation, adjusting and finishing.
- C. Submit, if requested by the Engineer, within thirty days after signing the Contract, a list of all materials and equipment ordered for the project, the manufacturers or agents from whom ordered, catalog and type, quantity ordered and promised delivery date of each item. Any subsequent changes in this list shall be promptly brought to the attention of the Engineer.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record finished locations of pipe runs, connections, manholes, cleanouts, and invert elevations.

1.7 QUALITY ASSURANCE

- A. Submit a certificate of compliance from the pipe, pipe coupling, fittings, and manhole manufacturers stating that the material complies with the specifications. Certificate shall include all applicable test result data and the date manufactured for each lot of material delivered to the project site. Certificate shall also show the date of the latest test.
- B. Materials used on the basis of a certificate of compliance may be sampled and tested at any time. Materials used on said basis shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the plans and specifications. Such material not conforming to requirements will be rejected.
- C. Each fitting, length of pipe, and manhole section shall be legibly marked with the name of the manufacturer, rating or class, type, service, schedule and specification number, in conformance with the applicable standard.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Store valves in shipping containers with labeling in place.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Block individual and stockpiled pipe lengths to prevent moving.
 - 3. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Perform Work according to:

1. The State of Louisiana Department of Health standards.
2. The Municipality Department of Public Works standards.

2.2 SANITARY SEWERAGE PIPING

A. Ductile-Iron Pipe:

1. Comply with ASTM A746, thickness in accordance ANSI A21.50 for Class 50 pipe wall thickness. Asphaltic coated outside and cement lined and seal coated inside in accordance with ANSI A21.10/AWWA C110.
2. Joints: Push on (boltless, single gasketed) similar to that known as "Super-Bell-Tite", "Fastite", "Tyton" or approved equal; or Mechanical Joint in accordance with ANSI A21.11/AWWA C111, corrosion resistant high strength low alloy steel bolts and nuts ("COR-TEN").
3. Fittings: Ductile iron, ANSI A21.10/AWWA C110.

B. PVC Plastic Pipe:

1. Pipe (for depths up to 12 feet): ANSI/ASTM D 3034, SDR 35, 12454-B PVC cell classification in accordance with ASTM D 1784; additives and fillers shall not exceed 10 parts (by weight) per hundred of PVC resin in the compound.
2. Pipe (for depths greater than 12 feet): ANSI/ASTM D 2241, SDR 26, 12454-B PVC cell classification in accordance with ASTM D 1784; additives and fillers shall not exceed 10 parts (by weight) per hundred of PVC resin in the compound.
3. Fittings: Same material and cell classification as pipe.
4. Solvent welded with solvent cement complying with ASTM D2564.

C. Polyethylene Pipe (PE Pipe):

1. Pipe: PE 3408, minimum cell classification valves shall be 345434C in accordance with ASTM D3350, 160 psi pressure rating, SDR17.
2. Joints: Butt fusion.
3. Fittings: Molded from a polyethylene compound having a cell classification equal to or exceeding the pipe compound; supplied by the same manufacturer of the pipe being supplied.

2.3 MANHOLES

- A. As specified in Section 330561 "Concrete Manholes."

2.4 FLEXIBLE COUPLINGS

- A. Manufacturers:
 - 1. Fernco Inc.
 - 2. Romac Industries, Inc.
- B. Material: Resilient, chemical-resistant, elastomeric PVC.
- C. Attachment: Two Series-300 stainless-steel clamps, screws, and housings.

2.5 FLEXIBLE PIPE BOOTS FOR MANHOLE PIPE ENTRANCES

- A. Manufacturers:
 - 1. A-Lok.
 - 2. Press-Seal Corporation.
- B. Material: EPDM.
- C. Comply with ASTM C923.
- D. Attachment: Series-300 stainless-steel clamp and hardware.

2.6 MATERIALS

- A. Bedding and Cover:
 - 1. Bedding: Fill Type A1, as specified in Section 310516 "Aggregates for Earthwork".
 - 2. Cover: Fill Type A1, as specified in Section 310516 "Aggregates for Earthwork".
 - 3. Soil Backfill from Above Pipe to Finish Grade: Soil Type S1, as specified in Section 310513 "Soils for Earthwork".

2.7 ACCESSORIES

- A. Pipe Markers: As specified in Section 330597 "Identification and Signage for Utilities."

2.8 SOURCE QUALITY CONTROL

- A. Provide shop inspection and testing of pipe.
- B. Owner Inspection: Notify Owner at least seven days before inspection is allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that trench cut or excavation base is ready to receive Work of this Section.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- B. Correct over-excavation with coarse aggregate.
- C. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- D. Protect and support existing sewer lines, utilities, and appurtenances.
- E. Utilities:
 - 1. Maintain profiles of utilities.
 - 2. Coordinate with other utilities to eliminate interference.
 - 3. Notify Architect/Engineer if crossing conflicts occur.

3.3 INSTALLATION OF PIPING AND MANHOLES

- A. Excavation and Trenching:
 - 1. Excavation shall include the removal, handling, rehandling, refill or backfilling, and disposal of any and all materials encountered in the work, and shall include all pumping, bailing, drainage and sheeting and bracing. It includes clearing and the removal of shrubbery and other obstructions not otherwise provided for.
 - 2. Perform all excavation, of whatever substance encountered, to depths indicated on the drawings or established by field stakeout.
 - 3. If the Engineer determines it is necessary to adjust, correct, relocate or in any way change the line and profile shown on the Plans, the Contractor shall perform the excavation and backfill required by said change under the terms of these specifications.
 - 4. All excavation shall be by open cut except where indicated otherwise in the Plans.
 - 5. Width of the trench to a point two (2) feet above the top of the pipe installation shall not exceed the external diameter of the barrel of the pipe plus nine (9) inches on each side. Additional cost for special foundation and backfill material and requirements as a result of failure to confine the excavation to this width shall be borne by the Contractor.
 - 6. Keep banks of trenches as nearly vertical as practical.
 - 7. Where required to control trench width, protect adjacent structures and to safeguard employees, properly sheet and brace trench.

8. Where in the opinion of the Engineer, damage is liable to result from withdrawing sheeting, the sheeting will be required to be left in place. Neither the giving of such orders by the Engineer nor his failure or refusal to issue such orders shall in any way relieve the Contractor of the responsibility for damages to pavements or structures.
9. When embedment material is not required, lay pipe on a firm, undisturbed, native earth foundation.
10. Prevent surface ground water from flowing into the excavations.
11. Remove all water accumulated in the trenches or other excavations by pumping or other approved methods prior to laying pipe.
12. Stockpile material suitable for backfilling a sufficient distance back from the edges of the excavation to avoid overloading and to prevent slides or cave-ins.
13. Control banks of all excavated areas to prevent movement of soil in areas supporting existing foundations, slabs, pole lines, pipelines or other structures. If, as a result of such excavation or through fault or neglect of the Contractor, the earth or ground under such structures is disturbed, corrective measures, as approved by the Engineer, shall be taken by and at the expense of the Contractor.
14. Keep all drains, gutters, culverts, etc. for surface drainage open, or if they are unavoidably closed, make other provisions for this drainage.
15. Length of the trench to be opened or the area of surface to be disturbed and unrestored at any one time will be limited by the Engineer with regard to both expeditious construction and the convenience and comfort of persons residing in the neighborhood or frequenting the street in question.
16. Trenches left open during non-working hours shall be properly protected from accidental entry.

B. Embedment:

1. Typical sewer foundations are as shown on the Typical Sewer Details.
2. All pipe shall be bedded in a Type I Foundation or as otherwise stated herein, in the Plans, or as determined in the field.
3. Where cuts to inverts of sewer mains are 12-feet or more, Type II foundation shall be required.
4. Where the bottom of the trench is not sufficiently stable or firm to prevent vertical or lateral displacement of the pipe after installation, the Engineer may direct the Contractor to provide a Type II foundation.

C. Manholes: As specified in Section 330561 "Concrete Manholes."

D. Pipe Installation:

1. Where a certain pipe material is specified on the Plans, only that material can be used. Where the term "Sewer Pipe" is shown on the plans or in the proposal, it shall be interpreted to mean any of the specified pipe materials meeting the requirements of this section, as the Contractor elects, of the dimension shown on the plans.
2. Install pipe in accordance with the manufacturer's recommendations and in accordance with the specifications herein. In addition, install PVC pipe in accordance with ASTM D2321. In the event there is a conflict, consult with Engineer for clarification.
3. Install solvent weld cap on the new line into the first manhole constructed immediately upstream of the existing manhole to prevent sewer gases from entering the work area and to prevent drainage into the existing system.
4. Thoroughly clean interior of pipe before lowering into the trench. Keep pipe interior clean and free of foreign matter during laying operations.

5. Do not lay pipe in unsuitable weather conditions. Stabilize wet trench conditions before laying pipe.
6. Plug open ends of pipe and fittings when work is not in progress.
7. Replace pipe found to be defective, before or after laying, with new pipe by and at expense of the Contractor.
8. Use embedment material for pipe bedding where required.
9. Grade pipe bedding by hand to provide uniform pipe bearing for its entire length and to provide proper grade and alignment.
10. Provide bell or coupling holes at each joint to permit proper joint assembly and pipe support.
11. Lay pipe with spigot end pointing in direction of flow.
12. Walking or working on the completed sewer pipe, except as may be necessary in tamping or backfilling shall not be permitted until the trench has been backfilled to a height of at least one foot above the top of the pipe.
13. Check each joint of pipe for line and grade before the next succeeding joint is placed.
14. Maintain proper alignment of pipe during haunching and initial and final backfilling operations.
15. Keep the sewer line pumped dry at all times.

E. Backfilling:

1. Where compaction density is specified, maximum density shall be determined in accordance with requirements of Louisiana DOTD Designation: TR 418 and TR 401.
2. Upon completion of joints and approval of Engineer, place acceptable material, free from stones, hard clay lumps, or other hard substances under the haunches of the pipe and up to the spring line of the pipe. Place initial backfill, in not more than 6-inch uniform loose lifts, to a point 12-inches above the top of the pipe. Compact each stage by hand or mechanical tamping to obtain a minimum of 85% maximum density.
3. Avoid displacement of the pipe in placement of backfill about the haunches.
4. Take care to avoid contact between the pipe and compaction equipment.
5. Backfill trenches for mains and services beneath existing pavement as shown in the Typical Sewer Details.
6. Compact remainder of backfill over and above 12-inch above the surface of the pipe for mains and services laid within the right-of-way as follows:
 - a. Backfill with select excavated site materials in not more than 12-inch uniform loose layers with each layer mechanically compacted to a minimum 90% of maximum density.
 - b. Within state highway right-of-way, the compaction requirements shall be 100% of the density of the surrounding undisturbed material, compacted in uniform loose layers of not more than 12-inches.
 - c. Slightly overfill the trench with backfill to create a crowned condition but not to exceed 6-inch.
7. Compact remainder of backfill over and above 12-inch above the surface of the pipe for mains and services laid outside the right-of-way as follows:
 - a. Backfill with select excavated material, in not more than 18-inches uniform loose lifts, to the elevation 24-inch below the finished ground surface.
 - b. Compact each layer of the material to eliminate all voids and to obtain a soil density equivalent to the existing undisturbed surrounding soil.
 - c. Compact the remaining top two feet of the trench backfill, in not more than 12-inch uniform loose lifts, to obtain a minimum of 90% of maximum density.
 - d. Slightly overfill the trench with backfill to create a crowned condition but not to exceed 6-inch.

8. The Contractor shall be responsible for obtaining suitable compaction of all trench backfill, including that in proposed streets, parking areas or other surfaced locations and shall be responsible for the failure of any surfacing due to trench settlement.
9. Compaction will be verified through compaction tests ordered by the Engineer at no expense to the Contractor, except as stated herein. If the test results indicate insufficient compaction, the cost for that compaction test and of all retesting shall be borne by the Contractor until satisfactory results are achieved. L.U.S. will pay only for those tests which prove that the specified compaction has been achieved.
10. Avoid damage to pipe during compaction.
11. Backfill material shall contain no stumps or roots and shall be free of lumber, trash, or other debris.
12. Use special backfill, with Engineer's approval, where the excavated material is not suitable for backfilling the trench and obtaining the required compaction. At the Contractor's option, limestone may be used for special backfill.
13. Maintain trenches in good and safe condition during construction and during one year warranty period.

3.4 SERVICE RISERS

- A. Install service risers as indicated on the Typical Sewer Details at locations shown on the Plans or designated in the field by the Engineer.
- B. For sewer mains 8" or larger, the tee shall be a short-body ductile iron tee conforming to AWWA C153.

3.5 WYE BRANCHES OR TEES

- A. Furnish wye branches or tees with connection of the size specified, securely and permanently fastened to the barrel of the pipe in the process of manufacture.
- B. Wyes and tees shall be given an inclination above a horizontal line and shall be properly bedded.
- C. All wyes and tees shall conform to the specifications and test standards of the pipe it is to be installed on.

3.6 TOLERANCES

- A. Maximum Variation from Indicated Slope: 1/8 inch in 10 feet.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Request inspection by Architect/Engineer prior to and immediately after placing bedding.
- C. Testing:

1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
2. Test sewer lines by low pressure air testing and television equipment. Deflection tests may also be performed as described below.
3. Test manholes by air vacuum testing, visual inspection, and by infiltration. Manhole leakage will not be acceptable.
4. Repair and retest manholes and sections of sewer lines which fail to meet the specified tests.
5. Do not remove plugs installed on the new system until the system has been accepted.
6. Furnish all equipment, labor and materials required for making the test.
7. Perform testing on Site sanitary sewage system according to local code of standards.
8. Pipe Testing:
 - a. Pressure Testing: As specified in Section 330505.41 "Air Testing".
 - b. Television Testing: As specified in Section 330130.11 "Television Inspection of Sewers".
 - c. Deflection Test:
 - 1) If during the operation of the television equipment by Owners Inspector there is suspicion of deflection of the sewer pipe, the Engineer reserves the right to require the Contractor to perform a deflection test on that section of pipe at the Contractor's expense.
 - 2) No pipe shall exceed a deflection of 5%.
 - 3) Test for deflection using a mandrel with a diameter equal to 95% of the inside diameter of the pipe.
 - 4) Perform test without mechanical pulling devices.
 - 5) Should any deflection test fail, Owner reserves the right to require the Contractor to perform deflection tests on any or all additional pipe.
9. Manhole Air Vacuum Test:
 - a. Air vacuum testing of manholes shall be performed on at least 20% of the manholes, minimum of one per project. The selection of which manhole(s) to be vacuum tested shall be determined by the Engineer.
 - b. Test manholes immediately after assembly of the manhole and the connecting pipes and before any backfill is placed around the manhole.
 - c. Plug lift holes.
 - d. Plug pipe openings, taking care to securely brace the plugs and the pipe.
 - e. Perform test using an inflatable compression band, vacuum pump and appurtenances specifically designed for vacuum testing manholes.
 - f. After the testing equipment is in place, a vacuum of 10 inches of Hg shall be drawn on the manhole. The manhole will be considered to have passed the test if the vacuum does not drop more than 1 inch of Hg in one minute.
 - g. If the manhole fails the initial test, the Contractor shall locate the leakage and make proper repairs, and retest until a satisfactory test result is obtained.
 - h. If any manhole fails the vacuum test, the Engineer reserves the right to require the Contractor to test any or all additional manholes Contractor's expense.
10. Manhole Infiltration Test
 - a. Construct a minimum 2' deep by 2' wide trench around the manhole.

- b. Fill the trench with water and drill 3/4" (minimum) holes 5' deep (or the depth of the manhole). These holes shall circle the manhole at 6" intervals.
- c. Two hours later the trench shall be refilled with water.
- d. Up to two hours after the second filling, the Engineer will check the manhole for infiltration.
- e. The manhole will be considered to have passed the test if no infiltration is detected. Repair and retest manholes failing the above test.

11. Visual Inspection

- a. After the manholes have been backfilled and prior to final acceptance of the project, any signs of leaks or weeping visible from the inside of the manhole shall be repaired by the Contractor and the manhole made watertight.

12. Compaction Testing:

- a. Comply with ASTM D698.

D. Prepare test and inspection reports.

3.8 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
- B. Cap open ends of piping during periods of Work stoppage.

END OF SECTION 333100

SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storm drainage piping.
2. Manholes.
3. Catch basins.

B. Related Requirements:

1. Section 310513 "Soils for Earthwork" for soils for backfill in trenches.
2. Section 310516 "Aggregates for Earthwork" for aggregate for backfill in trenches.
3. Section 310519.13 "Geotextiles for Earthwork" for geotextile filter fabric.
4. Section 312316 "Excavation" for product and execution requirements for excavation and backfill as required by this Section.
5. Section 312316.13 "Trenching" for execution requirements for trenching as required by this Section.
6. Section 312323 "Fill" for requirements for backfill to be placed under this Section.
7. Section 330561 "Concrete Manholes" for manholes and accessories as required by this Section.
8. Section 330597 "Identification and Signage for Utilities" for underground pipe markers.

1.2 COORDINATION

- A. Coordinate Work of this Section with termination of storm connection outside building, trenching and connection to public storm system.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Product Data:

1. Storm drainage piping.
2. Manholes.
3. Catch basins.

- B. Field Quality-Control Reports: For storm drainage piping, manholes and catch basins.

- C. Qualifications Statement: For manufacturer.

1.5 QUALITY ASSURANCE

- A. Perform Work according to the Louisiana Standard Specifications for Roads and Bridges, latest Edition standards (LA DOTD).

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store materials according to manufacturer instructions.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Perform Work according to the LA DOTD standards.

2.2 STORM DRAINAGE PIPING

- A. All pipe materials, fittings, Type T3 joints and bands shall conform to LA DOTD standards, engineering directives and approved material listings.
- B. Reinforced Concrete Pipe (RCP) or Reinforced Concrete Pipe Arch (RCPA):
- C. Thermoplastic Pipe (TPP), Polyvinyl Chloride Pipe (PVC) and Ribbed Polyvinyl Chloride Pipe (RPVC):
- D. Corrugated Polypropylene Pipe Double Wall (CPPPDW):
- E. Bituminous Coated Corrugated Steel Pipe (BCCSP) and Bituminous Coated Corrugated Steel Pipe Arch (BCCSPA):
- F. Corrugated Aluminum Pipe (CAP) and Corrugated Aluminum Pipe Arch (CAPA):

2.3 MANHOLES

- A. As specified in Section 330561 "Public Manholes and Structures."

2.4 CATCH BASINS

A. Shaft and Top Section:

1. Material: Reinforced precast or cast-in-place concrete pipe sections.
2. Joints: Lipped male/female.
3. Nominal Shaft Diameter: <Insert> inches
4. Top Section: Concentric cone.

B. Lids and Frames:

1. Manufacturers:
 - a. EJ.
 - b. Neenah Foundry Company.
 - c. Polylok, Inc.
2. Materials: Cast iron.
3. Lid:
 - a. Hinged.
 - b. Design: Linear grill or Checkerboard grill.
4. Nominal Lid and Frame Size: As specified on Drawings.

C. Base Pad:

1. Material: Cast-in-place concrete, as specified in Section 033000 "Cast-in-Place Concrete".

2.5 MATERIALS

A. Bedding:

1. Bedding: Fill Type A1, as specified in Section 310516 "Aggregates for Earthwork".

B. Backfill Material:

1. Type A: Fill Type A1 or A8 as specified in Section 310516 "Aggregates for Earthwork" or Flowable Fill as specified in Section 312323.33 "Flowable Fill". Place geotextile fabric to surround this backfill between the aggregate backfill material and all other natural or placed soils in the trench or embankment. Take care to prevent damage to geotextile fabric during placement of backfill material. For concrete pipe, enclose not only the initial backfill with the fabric, but wrap the fabric over the top of the pipe with at least 12 inches of overlap.
2. Type B: Fill Type S1 as specified in Section 310516 "Aggregates for Earthwork" or select soils that are natural soils with a maximum PI of 20, a maximum liquid limit of 35, and a maximum organic content of 5 percent. Soils with a silt content of 50 percent or greater and also a PI of 10 or less will not be allowed.

C. Backfill Locations:

1. Flexible Pipe under Flexible Pavements:
 - a. Use Type A initial backfill from bedding to 12-inches above pipe or up to natural grade.
 - b. Use Type B final backfill from 12-inches above pipe up to natural grade or pavement base.
2. RCP Pipe under Flexible Pavements:
 - a. Use Type A initial backfill from bedding to spring line (middle) of pipe.
 - b. Use Type B final backfill from spring line of pipe to natural grade or pavement base.
3. Flexible Pipe at all other locations:
 - a. Use Type B initial backfill from bedding to 12-inches above pipe.
 - b. Use Type B final backfill from 12-inches above pipe up to natural grade or pavement base.
4. RCP Pipe at all other locations:
 - a. Use Type B initial backfill from bedding to spring line of pipe.
 - b. Use Type B final backfill from spring line of pipe up to natural grade or pavement base.
5. Backfill above Type A or B backfill will be as specified in other Fill or Base Sections.

2.6 MIXES

- A. Grout: As specified in Section 036000 "Grouting".

2.7 FINISHES

- A. Steel Galvanizing:
 1. Comply with ASTM A123.
 2. Hot-dip galvanized after fabrication.
- B. Galvanizing for Nuts, Bolts, and Washers: Comply with ASTM A153.

2.8 ACCESSORIES

- A. Geotextile Filter Fabric: As specified in LA DOTD Sections 203.11 and 1019.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that trench cut is ready to receive Work of this Section.
- C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- B. Correct over-excavation with bedding material.
- C. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

3.3 INSTALLATION OF STORM DRAINAGE PIPING AND CATCH BASINS

- A. Excavation and Bedding:
 - 1. Excavate trench to depth of required bedding below pipe, and as specified in Section 312316.13 "Trenching."
 - 2. Hand trim excavation for accurate placement of piping to indicated elevations.
 - 3. Place minimum 6-inch-deep bedding material at trench bottom.
 - 4. Maintain optimum moisture content of bedding material to attain required compaction density.
- B. Piping:
 - 1. Pipe, Fittings, and Accessories: Comply with LA DOTD.
 - 2. Seal joints watertight.
 - 3. Backfilling and Compaction:
 - a. Type A Backfill: For all pipes, culverts, and conduits under paved and unpaved areas, where using Type A backfill material, thoroughly hand compact the Type A backfill under the pipe haunches and then dynamically compact in layers not exceeding 8 inches compacted thickness. Initially compact under the haunches of the pipe by hand tamping or other acceptable means, until reaching a level in which the dynamic tamping can commence. Compact each lift by applying at least eight passes of a hand operated, dynamic mechanical compaction device over the surface of each lift. With approval of the engineer, layer thickness may be increased to 12 inches with verification of satisfactory installation and

performance. If using flowable fill, furnish, place, and consolidate in accordance with Flowable Fill Section. Control placement operations during initial backfill operations without damage to protective coatings on metal pipes.

- b. Type B Backfill: For all pipes, culverts, and conduits where Type B backfill is allowed, place the Type B material in layers not exceeding 8 inches compacted thickness. Compact with suitable mechanical equipment. With approval of the engineer, layer thickness may be increased to 12 inches with verification of satisfactory installation and performance.
 - c. Do not displace or damage pipe while compacting.
- 4. Manholes: As specified in Section 330561 "Concrete Manholes."
 - 5. Connect to municipal storm sewer or system manholes.
 - 6. Connect to building storm drainage system.

C. Catch Basins:

- 1. Form bottom of excavation clean and smooth, and to indicated elevation.
- 2. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.
- 3. Level top surface of base pad.
- 4. Sleeve concrete shaft sections to receive storm sewer pipe sections.
- 5. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
- 6. Mount lid and frame level in grout, secured to top section to indicated elevation.

3.4 TOLERANCES

- A. Maximum Variation from Indicated Pipe Slope: 1/8 inch in 10 feet.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Request inspection by Architect/Engineer prior to and immediately after placing aggregate cover over pipe.
- C. Testing:
 - 1. Pipe Compaction Test: The in-place density of Type A backfill materials and bedding materials will not be measured or calculated. Place Type A backfill, exclusive of RAP and flowable fill, at or near optimum moisture content in accordance with DOTD TR 415 or 418. Place and compact RAP materials in a slightly moist condition.
 - 2. Determine the maximum dry density of initial or final Type B backfill under all paved areas which are to be under traffic in accordance with DOTD TR 415 or TR 418. Determine in-place density in accordance with DOTD TR 401. Place initial and final Type B backfill under all paved areas under traffic, at or near optimum moisture content in accordance with DOTD TR 415 or TR 418. Compact each layer by approved methods prior to the placement of a subsequent layer. The engineer will approve the compaction method upon validation that such method, including moisture control, will achieve at least 95 percent of maximum dry density in accordance with DOTD TR 401. Density testing on subsequent backfill layers may be waived by the engineer if installation has

been in accordance with approved compaction methods and performance has been continuously satisfactory. Place initial and final backfill in unpaved or paved areas, such as shoulders or driveways, evenly and compact along the length of the culvert, pipe, or drain from the top of the initial backfill to the top of the subgrade. Compact layered backfill to at least the density of the adjoining existing soils or the compaction required of the laterally adjoining layers of soil immediately outside the trench for embankment elevations. Place and compact initial and final backfill at or near optimum moisture content in accordance with DOTD TR 415 or TR 418.

3. Manholes: As specified in Section 330561 "Concrete Manholes."
4. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.

D. Prepare test and inspection reports.

3.6 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 334200