

**PROJECT MANUAL
FOR**

New Fire Station No. 3



University Parkway
Natchitoches, LA

PROJECT NO. 222706059

September 26, 2025



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University Parkway

Natchitoches, LA

Project No. 222706059

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ADVERTISEMENT FOR BIDS

October 16, 2025

City of Natchitoches (hereinafter referred to as "Owner")

Sealed bids marked "Sealed Bid – New Fire Station No. 3, University Pkwy, Natchitoches, LA 71457" will be received by the Owner for the construction of the project described as follows:

New Fire Station No. 3
University Pkwy
Natchitoches, LA 71457
City of Natchitoches Bid No. 0678

Bids shall be addressed to the City of Natchitoches and received by the City of Natchitoches Purchasing Director, Edd Lee, whose office is located at 1400 Sabine Street, Natchitoches, LA 71457, not later than **2:00 p.m., local time, on Thursday, November 20, 2025**. At that time, the Bids will be opened and read aloud. Bids shall be designated as **"Sealed Bid – New Fire Station No. 3, University Pkwy, Natchitoches, LA 71457"**.

All bids must be submitted on the proper form. The contractor must display his contractor's license number prominently on the outside of the envelope. Any bids received after the specified date and time will not be considered. Electronic bids may be submitted through www.bidexpress.com.

Bids shall be accepted from Contractors who are licensed under LA. R.S. 37:2150-2192 for the classification of **Building Construction**.

Copies: Complete Bidding Documents for this project are available in electronic form. They may be obtained without charge and without deposit from www.aeplans.com. Printed copies are not available from the Architect but arrangements can be made to obtain them through most reprographic firms and/or plan rooms. When the designer of record issues bid documents in electronic form, prime bidders shall be given the option of receiving the documents in paper form in accordance with LARS 38:2212. Reproduction cost on the first paper plan set acquired by bona fide prime bidders will be fully refunded by the design professional upon return of the documents no later than ten days after receipt of the bids. All other plan holders are responsible for their own reproduction costs. Questions about this procedure shall be directed to the Architect at:

Stantec Architecture Inc.
1200 Brickyard Lane – Suite 400
Baton Rouge, Louisiana 70802
Telephone: (225) 921-6141

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

Each Bidder must deposit with his/her bid, security in the amount, form, and subject to the conditions provided in the Information for Bidders. Sureties used for obtaining bonds must appear as acceptable on the U.S. Department of Treasury Circular 570.

No bidder may withdraw his/her bid within forty-five (45) days after actual date of the opening thereof.

The Contractor shall begin mobilization and procurement of materials within ten (10) working days of the receipt of the Notice to Proceed.

A **Non-Mandatory Pre-Bid Conference** will be held at the **City of Natchitoches Purchasing Department** located at 1400 Sabine Street, Natchitoches, LA 71457 at **11:00 am on Thursday, November 6, 2025**. The purpose of the pre-bid conference is to familiarize Bidders with the requirements of the project and the intent of the Contract Documents, and to receive comments and information from interested Bidders. Any revisions of the Bidding Documents made as a result of the pre-bid conference shall not be valid unless included in an addendum issued in accordance with Article 3 of the Instructions to Bidders.

Any person with disabilities requiring special accommodations must contact the City of Natchitoches at (318) 357-3870 no later than seven (7) days prior to the bid opening.

IN PARTICULAR, BIDDERS SHOULD NOTE THE REQUIRED ATTACHMENTS AND CERTIFICATIONS TO BE EXECUTED AND SUBMITTED WITH THE BID PROPOSAL.

CITY OF NATCHITOCHES

Ronnie Williams, Jr., Mayor

Natchitoches Times Publication Dates:

October 16, 2025

October 23, 2025

October 30, 2025

ARCHITECTS AND ENGINEERS

New Fire Station No. 3

University Parkway
Natchitoches, LA 71457

Project No. 222706059

Architects

Stantec Architecture Inc

100 Brickyard Lane -
Suite 400
Baton Rouge, Louisiana
70802

Phone: (225) 765-7400



Structural / Civil Engineers

Meyer, Meyer, LaCroix and Hixson, Inc.

100 Engineer Pl.
Alexandria, Louisiana 71303
Phone: (318) 448-0888

Mechanical & Electrical Engineers

Thompson Luke & Associates, LLC

10705 Rieger Road, Ste. 101
Baton Rouge, LA 70809

Phone: (225) 293-9474

INSTRUCTIONS AND INFORMATION TO BIDDERS

New Fire Station No. 3

ARTICLE 1 - DEFINITIONS

The Bidding Documents include the following:

1. Instructions and Information to Bidders
2. Louisiana Uniform Public Work Bid Form
3. Standard Form of Agreement between Owner and Contractor
where the basis of payment is a Stipulated Sum (AIA Document **A101-2017**)
4. General Conditions of the Contract for Construction (AIA Document **A201- 2017**)
5. Supplementary Conditions to the General Conditions of the Contract for Construction
6. Specifications, Sections TC through Division 16 dated **September 26, 2025**.
7. Drawings, Sheets Nos. See **Drawing No. G001** dated **September 26, 2025** for index of Drawings.
8. Addenda issued during the Bid period and acknowledged in the Bid Form.

All definitions set forth in the General Conditions of the Contract for Construction, AIA Document **A201-2017**, or in other Contract Documents, are applicable to the Bidding Documents.

Addenda are written or graphic instructions issued by the Architect prior to the opening of Bids which modify or interpret the Bidding Documents by addition, deletions, clarifications or corrections.

A Bid is a complete and properly signed proposal to perform Work or designated portion for a stipulated sum. A Bid is submitted in accordance with the Bidding Documents, is evaluated on price alone and is not subject to qualification.

Base Bid is the amount of money stated in the Bid as the sum for which the Bidder offers to perform the Work described in the Bidding Documents, prior to the adjustments for Alternate Bids but including any unit prices.

An Alternate Bid (or Alternate) is a specified item of construction that is set apart by a separate sum. An Alternate may or may not be incorporated into the Contract Sum, at the discretion of the Owner at the time of award.

A Unit Price is the amount stated in the Bid as a price per unit of materials and/or services.

A Bidder is an entity or a person who submits a Bid for a prime contract with the Owner.

A Bidder is not a contractor on a specific project until a contract is signed between the Bidder and the Owner.

A Sub-Bidder is one who submits a Bid to a Bidder for materials and/or for a portion of the work.

ARTICLE 2 - BIDDER'S REPRESENTATIONS; LICENSING

Each Bidder, by submitting its Bid, represents that: (i) it has read and understands the Bidding Documents, and its Bid is made in accordance therewith; (ii) it has visited the Project site and has familiarized itself with the conditions under which the Work is to be performed; and (iii) its Bid is based upon the materials, systems and equipment described in the Bidding Documents, without exceptions.

The Bidder must be fully qualified under the Louisiana State Licensing Law for Contractors, La. R.S. 37:2150, et seq., in the classification "Building Construction", before submitting its Bid. Only the Bids

of Contractors duly licensed under the Louisiana State Licensing Law for Contractors will be considered. The Contractor shall be responsible for determining that all of its prospective Subcontractors are duly licensed under the Louisiana State Licensing Law for Contractors.

ARTICLE 3 - BIDDING DOCUMENTS

Copies

Complete Bidding Documents for this project are available in electronic form. They may be obtained without charge and without deposit from www.aeplans.com. Printed copies are not available from the Architect but arrangements can be made to obtain them through most reprographic firms and/or plan rooms. Documented reproduction cost on the first paper plan set acquired by bona fide prime Bidders will be fully refunded by the design professional upon return of the documents no later than ten days after receipt of the Bids. All other plan holders are responsible for their own reproduction costs. Questions about this procedure shall be directed to:

Stantec Architecture Inc.
1200 Brickyard Lane, Suite 400
Baton Rouge, Louisiana 70802
Telephone: (225) 765-7400

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

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

Interpretation or Correction of Bidding Documents

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

Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect, to reach the Architect at least seven (7) days prior to the date for receipt of Bids.

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

Substitutions

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

The name of a certain brand, make, manufacturer, or definite specifications is to denote the quality of standard of the article desired, but does not restrict bidders to the specific brand, make, manufacturer, or specification named. It is to set forth and convey to prospective bidders the general style, type, character, and quality of the article desired.

When in specifications or contract documents a particular brand, make of material, device, or equipment is shown or specified, such brand, make of material, device, or equipment shall be regarded merely as a standard.

When in specifications or contract documents an architect or engineer specifies a particular brand, make of material, device, or equipment, or equal thereto, he shall adequately identify said product by including, minimally, the model or catalog number of the product.

If a potential supplier wishes to submit for prior approval a particular product other than a product specified in the contract documents, he shall do so no later than seven working days prior to the opening of bids. Within three days, exclusive of holidays and weekends, after such submission, the prime design professional shall furnish to both the public entity and the potential supplier written approval or denial of the product submitted.

No substitution will be considered unless a written request for approval has been submitted by the Bidder, and has been received by the Architect at least seven (7) days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted, and a complete description of the proposed substitute, including drawings, cuts, performance and test data, and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the Bidder. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

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

Addenda

Addenda will be posted at the web site noted above for bidding documents.

Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

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

ARTICLE 4 - BIDDING PROCEDURE

Form and Style of Bids

Bids shall be submitted on the Bid Form provided herein (or revised by Addendum)

All blanks on the Bid Form shall be filled in by typewriter or manually in ink.

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

Any interlineations, alteration or erasure must be initialed by the signer of the Bid.

Bidders are cautioned to complete all Alternates and Unit Prices, should such be required in the Bid Form. Failure to submit Alternates and Unit Prices will render the Bid informal and may cause its rejection.

Bidder shall make no additional stipulations on the Bid Form, nor qualify its Bid in any other manner.

The Bid shall include evidence of agency, corporate, or partnership authority in accordance with **La. R.S. 38:2212(B) (5)**.

The Contractor shall certify that it is licensed under the Louisiana State Licensing Law for Contractors, and show its license number on the Bid Form, and on the outside of the envelope containing the Bid Form.

Submission of Bids

Bids shall be sealed in an opaque envelope and will be received until the time specified and at the place specified in the **attached advertisement** (unless changed by Addendum). The Bid envelope shall be identified on the outside with the name of the project, and the name, address, and Louisiana Contractor License Number of the Bidder. 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. Bids shall be deposited at the designated location prior to the time on the date for receipt of Bids, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened.

Bidder shall assume full responsibility for timely delivery at location designated for receipt of Bids. Late delivery of a Bid for any reason, including late delivery by United States Mail, will disqualify the Bid.

Oral Bids are invalid and will not receive consideration; nor will notations on the envelope for amending the Bid.

ARTICLE 5 - CONSIDERATION OF BIDS

Rejection of Bids

Only as allowed by just cause per LA R.S. 38:2214.

Acceptance of Bid

It is the intent of the Owner to award a contract to the lowest responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents, is judged to be reasonable, and does not exceed the funds available.

Alternates quoted on Bid Forms will be exercised as an Owner option. The Owner will award Alternates in the order listed unless it does not affect the award of the contract. Accepted alternates will be listed in Owner-Contractor Agreement.

ARTICLE 6 - POST BID INFORMATION

Submissions

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)], 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 the Owner within 10 days after the opening of bids.**

The Bidder shall, within **10 days** after notice of acceptance of its Bid and prior to the award of building contracts for the Work, submit the following information to the Architect:

The proprietary names, model numbers, specifications, the Suppliers and detailed shop drawings of principal items of material and equipment proposed for the Work.

The Bidder shall be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the proposed Suppliers and Subcontractors to furnish and perform the Work described in the sections of the Specifications pertaining to such proposed Suppliers' and Subcontractors' respective Work.

The Architect will notify the Bidder if either the Owner or the Architect, after due investigation, has reasonable and substantial objection to any person or organization on the Contractor's list of proposed Subcontractors or Suppliers.

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

ARTICLE 7 - PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

Bonds Required

The selected Bidder shall furnish and pay for a performance and a payment bond written by a company licensed to do business in Louisiana, each in an amount equal to 100% of the Contract Sum, and subject to the requirements specified in the Contract Documents.

Time of Delivery and Form of Bonds

The Bidder shall deliver the required bonds to the Owner simultaneously with the execution of the Contract. Bonds shall be in the form furnished or approved by Owner (A312 Performance and Payment Bond form). The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his Power of Attorney.

ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

The Contract between the Owner and the Contractor shall consist of the Standard Form of Agreement between Owner and Contractor where the basis of payment is a Stipulated Sum (AIA Document A101-2007), and all documents enumerated therein as Contract Documents.

Before award of the Contract, the successful Bidder shall furnish to the Owner a certified copy of the resolution authorizing the Contractor to enter into the contract to perform the work and evidencing the authority of the person signing the Contract behalf of the Contractor.

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 as required by LA R.S. 38:2224.**

ARTICLE 9 – OTHER TERMS

Withdrawal of Bid

The Bidder agrees that its Bid is firm for a period of forty-five (45) days from the opening of Bids, and no Bid can be withdrawn for any reason during this period of time.

Substantial Completion of Project

The Bidder guarantees substantial completion of the Project within **465 calendar days** after issuance of the Notice to Proceed. This includes the Base Bid and any Alternates selected by the Owner.

Liquidated Damages

The Owner may retain the sum of **One Thousand Dollars (\$1,000.00)/day** for each calendar day after the above-noted substantial completion date (holidays included) that the work remains incomplete for

the Project.

Commencement of Work

The Bidder agrees that Work will begin not later than ten (10) calendar days after the issuance of the Notice to Proceed and shall be diligently prosecuted at such rate and in such manner as, in the opinion of the Architect, is necessary for the completion of the Work within the Contract Time, it being understood that time is the essence of the Contract.

Bid Security

All Bids must be accompanied by bid security equal to five percent (5%) of the Base Bid, and must be in the form of a certified check, cashier's check, or bid bond. The payee or obligee, as applicable, of the Bid Security shall be **The City of Natchitoches**. If a bid bond is used, it shall be written by a surety or insurance company meeting the requirements of La. R.S. 38:2218(C). After the time and date designated for the receipt of Bids, Bids may be withdrawn without penalty or forfeiture of the Bid Security only in the case of patently obvious mechanical, clerical or mathematical errors, and if clear and convincing sworn, written evidence of such errors is furnished to the Owner within forty-eight (48) hours after the time and date designated for receipt of Bids, excluding Saturdays, Sundays and legal holidays. If the successful Bidder withdraws its Bid or refuses to enter into a contract with the Owner, the Owner will retain the Bidder's Bid Security as liquidated damages, but not as a penalty, in addition to other rights and remedies available to the Owner by law. The Bid Security of the lowest Bidder will be retained until after the Bidder to whom the award is made has entered into the Contract and has provided the required performance bond and labor and material payment bond. All other Bid Security will be returned to the Bidders after the Contract has been awarded or after all Bids have been rejected.

ARTICLE 10 – PREBID CONFERENCE

A **Non-Mandatory Pre-Bid Conference** will be held at **City of Natchitoches Purchasing Department** located at 1400 Sabine Street, Natchitoches, LA 7145 at **11:00 am on Thursday, November 6, 2025**. The purpose of the pre-bid conference is to familiarize Bidders with the requirements of the project and the intent of the Contract Documents, and to receive comments and information from interested Bidders. Any revisions of the Bidding Documents made as a result of the pre-bid conference shall not be valid unless included in an addendum issued in accordance with Article 3 of the Instructions to Bidders.

END OF SECTION

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: City of Natchitoches
700 Second Street
Natchitoches, Louisiana

BID FOR: New Fire Station No. 3
University Parkway
Natchitoches, LA

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: Stantec Architecture Inc. and dated: **September 26, 2025**

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

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

_____ Dollars (\$ _____)

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

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

_____ Dollars (\$ _____)

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

_____ Dollars (\$ _____)

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

_____ Dollars (\$ _____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

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

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

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

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

BID BOND

Date: _____

KNOW ALL MEN BY THESE PRESENTS:

That _____ of _____, as Principal, and _____, as Surety, are held and firmly bound unto the **City of Natchitoches** (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)

New Fire Station No. 3
University Parkway
Natchitoches, Louisiana
Project No. 222706059

STATE OF LOUISIANA

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) | (c) Extortion (R.S. 14:66) |
| (b) Corrupt influencing (R.S. 14:120) | (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) | (f) Bank fraud (R.S. 14:71.1) |
| (b) Identity Theft (R.S. 14:67.16) | (g) Forgery (R.S. 14:72) |
| (c) Theft of a business record
(R.S.14:67.20) | (h) Contractors; misapplication of
payments (R.S. 14:202) |
| (d) False accounting (R.S. 14:70) | (i) Malfeasance in office (R.S. 14:134) |
| (e) Issuing worthless checks
(R.S. 14:71) | |

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.

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 _____, 2025__.

Notary Public

STATE OF LOUISIANA
PARISH OF _____

PROJECT NO. 222706059

PROJECT NAME: **New Fire Station No. 3**
University Parkway
Natchitoches, LA

NON-COLLUSION AFFADAVIT

Before me, the undersigned authority, duly commissioned and qualified within and for the State & Parish aforesaid, personally came & appeared _____ representing _____ 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 _____, 2025.

NOTARY

CONTRACT FORM

- A. The CONTRACT to be used on this project will be **AIA Document A101, 2017 Edition**.
- B. A copy of the contract form may be obtained from the office of the Architect or from LA Architects Association, 521 America Street, Baton Rouge, LA 70802.
- C. When the contract is executed it will contain the following information:
 - Insurance Certificates
 - Performance Bond
 - Copy of Construction Proposal

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

New Fire Station No. 3
University Parkway
Natchitoches, LA 71457

THE OWNER:

(Name, legal status and address)

City of Natchitoches
700 Second Street
Natchitoches, LA 71457

THE ARCHITECT:

(Name, legal status and address)

STANTEC Architecture Inc.
1200 Brickyard Lane – Suite 400
Baton Rouge, LA 70802

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ADDITIONS AND DELETIONS:

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These

obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional,

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work,

provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- .1 employees on the Work and other persons who may be affected thereby;

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities

proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

Additions and Deletions Report for

AIA® Document A201® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

New Fire Station No. 3
University Parkway
Natchitoches, LA 71457

...

City of Natchitoches
700 Second Street
Natchitoches, LA 71457

...

STANTEC Architecture Inc.
1200 Brickyard Lane – Suite 400
Baton Rouge, LA 70802

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 07:30:38 ET on 07/29/2025 under Order No. 3104240135 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

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.

3.9 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, except credit will not be required for Overhead and Profit. Where a change results in both credits to the Owner and extras to the Contractor for related items, overhead and profit shall only be computed on the net extra cost to the Contractor.

7.2.4 The cost to the Owner resulting from a change in the Work shall be the sum of: Cost of the Work (as defined at 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

FEB 2019-

Modified 9/13/20

SC 9

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. **(NOTE: Where a Schedule of Values Format is not attached, Contractor shall use the Table of Contents listing each SECTION.)** 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 an Application & Certificate for Payment on the AIA Document G702-1992, accompanied by AIA Document G703-1992, and supported by any additional data substantiating the Contractor's right to payment as the Owner or the Architect may require. Application for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated into the Work and of materials, suitably stored, at the site as of the twenty-fifth day of the preceding month, less normal retainage as follows, per 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 Pay requests for material stored on site **shall require invoices** to be included with pay requests. **Only materials stored on site and confirmed by the Professional of Record will be considered for payment.**

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 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

9.10.1 After the second sentence, add the following:

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

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 with Qualification of: notwithstanding the foregoing, all Terms and Conditions in Sections 11.1, 11.2, 11.3, 11.4, and 11.5 of AIA A201-2017 are unamended as pertains to the Architect and Architect’s Consultants.

INSURANCE REQUIREMENTS FOR NEW CONSTRUCTION, ADDITIONS AND RENOVATIONS

11.1 CONTRACTOR’S LIABILITY INSURANCE

FEB 2019-

Modified 9/13/20

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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 project number and project name shall be included on this endorsement.**

COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

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

occur limit**

occur limit**

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 an **Owner** 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 **OWNER**, its departments, agencies, agents and employees as an employer, whether pursuant to the Louisiana Worker's Compensation Act or otherwise, under any circumstance. The parties also hereby agree that the **OWNER**, its departments, agencies, agents and employees shall in no circumstance be, or considered as, the employer or statutory employer of Contractor, its Owners, agents and employees. The parties further agree that Contractor is a wholly independent Contractor and is exclusively responsible for its employees, Owners, and agents. Contractor hereby agrees to protect, defend, indemnify and hold the **OWNER**, its departments, agencies, agents and employees harmless from any such assertion or claim that may arise from the performance of this contract.

11.3.6 Indemnification/Hold Harmless Agreement

Contractor agrees to protect, defend, indemnify, save, and hold harmless, the **OWNER**, all Departments, Agencies, Boards and Commissions, its officers, agents, servants, employees and volunteers, from and against any and all claims, damages, expenses and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur, or in any way grow out of, any act or omission of Contractor, its agents, servants and employees, or any and all costs, expenses and/or attorney fees incurred by Contractor as a result of any claims, demands, suits or causes of action, except those claims, demands, suits or causes of action arising out of the negligence of the **OWNER**, all 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 **OWNER** may, but is not required to, consult with the Contractor in the defense of claims, but this shall not affect the Contractor's responsibility for the handling and expenses of all claims.

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 **Contractor** 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 **(in an acceptable method to the Architect-agreed upon prior to construction start)** 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

NOTE: 0.10 inches of rain shall have fallen within a 24 hour period in order to be considered a "Rain Day". "Wet Days" associated with these "Rain Days" shall not be considered for extensions of time.

Any request for extensions of time based on "Rain Days" must indicate how these conditions had an adverse effect on subject project and the project's overall critical path. The Contractor shall make every effort to restructure schedule as not to cause an extension of the critical path.

Extensions of time will not be considered for interior work.

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.

SECTION 01005
ADMINISTRATIVE PROVISIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Title of work, and type of contract.
- B. Contract Method
- C. Invited Bidders
- D. Work Sequence
- E. Contractor Use of Premises.
- F. Coordination.
- G. Allowances.
- H. Unit Prices.
- I. Reference Standards.
- J. Disposal of Material.
- K. Demolition.
- L. Drawings.
- M. FIRE PROCEDURES FOR CONSTRUCTION WORKERS
- N. INFECTION CONTROL IN CONSTRUCTION AREAS

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of the Core and Shell Contract comprises general construction including structural, civil, mechanical and electrical for:

New Fire Station No. 3

University Parkway
Natchitoches, LA

Stantec No. 222706059

1.03 CONTRACT METHOD

- A. Construct the Work under a single lump sum contract.
- B. **NO SALES TAX:** The Owner is exempt from State Sales Tax. Prepare Bid Proposals accordingly. **The City of Natchitoches** is a tax-exempt entity. Contractors and sub-contractors are expected to purchase materials as agents of the **City of Natchitoches** and comply with all requirements for maintaining tax-free status. The **City of Natchitoches** will provide documentation and assistance for tax-free purchasing agency. **All contractors and sub-contractors should calculate their bids on a tax-free basis and will bear the loss should they fail to comply with the law concerning tax-free entities. Form R-1020** shall be used for documentation. *The form may be downloaded and must be completed/ filed with LDR.* Further information concerning NO SALES TAX is available from the City.

1.05 CONTRACT AND SPECIAL PROVISIONS

- A. Owner will pay any electrical connection charges for permanent power. This contractor shall provide for construction utilities.
- B. The **owner will pay any sewer impact fee** to the city at the appropriate time. The city water connection fees will be paid by owner.

1.06 WORK SEQUENCE

- A. Construct Work in stages to accommodate Owner's occupancy requirements during the construction period. Coordinate construction schedule and operations with Architect. Phases shall be completed and ready for occupancy in order listed. (Example: Phase 2 cannot start until Phase 1 is completed.)
- B. Phasing shall be as outlined on Drawings. Contractor shall coordinate incorporate activities into the Stages outlined on Drawings as required to maintain operations.
- C. Phasing Schedule: **Only as indicated on Drawings.**

1.07 UNIT PRICES & ALTERNATES (As may be required.)

- A. Where appropriate contractors shall request and submit unit prices with their bid proposal.
- B. Contractors shall submit unit prices with their bid proposal in accordance with Unit Prices Proposal Form.
- C. Base Bid, Alternates and Unit Prices shall be considered in determining the Low Bidder.
- D. Unit Prices shall remain firm for the duration of the construction period.

1.09 CONTRACTOR USE OF PREMISES

- A. Access to and from construction areas will need to be coordinated with outside vendors, Owner Representatives, and Architect/Engineer as required during the Construction Process.
- B. See section 01500 for additional requirements.
- C. Contractor shall keep the site and building clean at all times.
- D. Disposal of volatile wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems or into streams or waterways is not permitted.
- E. No Smoking shall be allowed on the campus by any employees of the Contractor.
- F. Conflicts: Where a conflict exists between codes, standards, Contract Documents, or any combination of, **the most stringent requirements shall apply**. Should requirements for any item or method appear in any one area or category of Construction Documents, the item or method shall be incorporated into the Work even if not appearing in any other document.
- G. Contractor shall verify all measurements of any existing condition or specialty equipment to be installed and shall be responsible for their correctness.
- H. Necessary mechanical and electrical shut-downs must be scheduled in advance with the Owner and shall be done during non-critical times designated by the Owner. Contractor shall utilize the **SERVICE SHUT-DOWN CONFIRMATION** form found at the end of this Section when requesting a shut-down. This form shall be used for each shut-down requested and shall be submitted a minimum of **3 Days** prior to anticipated shut-down date.
- I. The Contractor shall be responsible for any overtime work necessary to accomplish shut downs at non-critical times, and no extra compensation will be allowed.
- J. Contractor shall keep the site and building clean at all times. Contractor shall provide one employee **as a minimum** for the sole purpose of housekeeping, **2 hours per day**, five days a week, unless the job is closed down due to a general strike or conditions beyond the control of the Contractor or until Termination of the Contract in accordance with the Contract Documents.
- K. Flammable materials shall be stored only in **2 hour fire rated** enclosures.

1.10 COORDINATION

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Verify characteristics of elements of interrelated operating equipment are compatible; 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 conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs. *With the Architects approval, adjust stud depths as required to accommodate recessed panels, boxes and plumbing.*

1. Back to Back Service Boxes are not allowed.

- D. In finished areas except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming work, and provide neat openings for penetrations of surfaces. Seal penetrations through floors, walls, and ceilings.
- F. Contractor shall coordinate with Architect and equipment installation personnel in connection with equipment to be provided by Owner. .
- G. Asbestos: If Contractor uncovers any asbestos, they are to notify the Owner via the Architect for its removal. Contractor will coordinate with Asbestos Contractor if required.

1.11 REFERENCE STANDARDS

- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by codes.
- B. The date of the standard is that in effect as of the bid date unless noted otherwise.
- C. Obtain copies of standards when required by Contract Documents. Maintain copy at job site during progress of the specific work.

1.12 DISPOSAL OF MATERIAL

- A. The Owner shall have first salvage rights to any material or equipment removed from site.
- B. All salvable material that is not scheduled for re-use in this contract shall become the property of the Contractor and shall be removed from the site by the Contractor.
- C. Non-salvable material, debris and rubble shall be hauled to the City Disposal Area by the General Contractor at his cost.
- D. Removals shall be disposed of as soon as practical and material shall not be allowed to accumulate either inside or outside the building.

1.13 DEMOLITION

- A. The Contractor shall perform all demolishing 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. Maintain existing fire ratings accordingly.

1.14 DRAWINGS

- A. Drawings : See Drawing Index Sheet.

PART 2 - PRODUCTS

2.01 HAZARDOUS MATERIALS

- A. There will be no materials containing asbestos used on this project. Contractor may be required to certify this at the close of the project.
- B. Material data sheets shall be furnished on all material used in this construction.

PART 3 - EXECUTION (not used)

END OF SECTION

SECTION 01045
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED REQUIREMENTS

- A. Section 01005 - Administrative Provisions
- B. Individual Specifications Sections:
 - 1. Cutting and patching incidental to work of the Section.
 - 2. Advance notification to other Sections of openings required in work of those Sections.
 - 3. Limitations on cutting structural members.

1.03 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather-exposed or moisture-resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight-exposed elements.
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed work, and products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect of work on Owner or separate contractor.
 - 7. Written permission of affected separate contractor.
 - 8. Date and time work will be executed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Those required for original installation or to match original installation.
- B. For any change in materials, submit request for substitution under provisions of Section 01600.

PART 3 - EXECUTION

3.01 GENERAL

- A. Unless noted otherwise in specific sections cutting shall be done as required under individual sections.
- B. All patching shall be done by General Contractor.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install ill-timed work.
 - 3. Remove and replace defective and non-conforming work.

4. Remove samples of installed work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical work.

3.02 INSPECTION

- A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- B. After uncovering, inspect conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.03 PREPARATION

- A. Provide supports to assure structural integrity of surroundings. Provide devices and methods required to protect other portions of Project from damage of cutting.
- B. Provide protection from elements for areas which may be exposed by uncovering work.

3.04 PERFORMANCE

- A. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- B. Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- C. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval.
- D. Restore work with new products in accordance with requirements of Contract Documents.
- E. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- F. At penetrations of fire-rated and smoke walls, ceilings, or floor construction, completely seal voids with fire-rated, fire resistant material, full thickness of the construction element.
- G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor participation in preconstruction conferences.
- B. Contractor administration of progress meetings and pre-installation conferences.

1.02 RELATED REQUIREMENTS

- A. Instructions to Bidders: Pre-Bid Conference.
- B. Instructions to Bidders: Post-Bid Information.
- C. Section 01005 - Administrative Provisions.
- D. Section 01300 - Submittals: Progress Schedules.
- E. Section 01300 - Submittals: Shop drawings, product data, and samples.
- F. Section 01400 - Quality Control.
- G. Section 01700 - Contract Closeout: Project record documents.

1.03 PRECONSTRUCTION CONFERENCES

- A. After notification that the Contract has been executed, the Architect shall arrange with the Owner, and Contractor and conduct a pre-construction conference to be held at the project site. The Contractor shall be responsible to see that his principal sub-contractors are in attendance and shall furnish to the Architect and Owner, 1) the Schedule of Values, 2) list of sub-contractors and material suppliers, 3) the Construction Schedule.
- B. Architect will administer conference at Project site for clarification of Contractor responsibilities in use of site and for review of administrative procedures.

1.04 PROGRESS MEETINGS

- A. The Architect shall establish and conduct a regular schedule of monthly meetings to be held on the job site each month throughout the construction period, and shall require attendance at the meetings by representatives of his Consultants, the Contractor and his principal sub-contractors. The Owner shall be notified of such meetings and may be represented.
- B. It shall be the principal purpose of these meetings or conferences, to effect coordination, cooperation and assistance in every practical way to the end of maintaining progress of the project on schedule and completing the project within the contract time.
- C. Contractor shall make physical arrangements for meetings, prepare agenda with copies of participants, record minutes, and distribute copies within two days to Architect, participants, and those affected by decision made at meetings.

1.05 PREINSTALLATION CONFERENCES

- A. When required in individual specification Section, convene a preinstallation conference prior to commencing work of the Section.
- B. Require attendance of entities directly affecting, or affected by, work of the Section.
- C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Procedures.
- B. Construction Progress Schedules.
- C. Schedule of Values.
- D. Shop Drawings.
- E. Product Data.
- F. Samples.
- G. Manufacturer's Instructions.
- H. Manufacturer's Certificates.

1.02 PROCEDURES

- A. Deliver submittals to Architect at address listed on cover of Project Manual.
- B. Transmit each item under Architect-Accepted Form. Identify Project, Contractor, subcontractor, major supplier; identify pertinent Drawing sheet and detail number, and Specification Section number, as appropriate. Identify deviations from Contract Documents. Provide space for Contractor and Architect/Engineer review stamps. Contractor shall review shop drawings prior to submitting to Architect.
- C. Submit initial progress schedules and schedule of values in duplicate within 15 days after date of Written Notice to Proceed. After review by Architect/Engineer revise and resubmit as required. Submit revised schedules with each Application for Payment, reflecting changes since previous submittal.
- D. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.
- E. After Architect/Engineer review of submittal, revise and resubmit as required, identifying changes made since previous submittal.
- F. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.03 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit horizontal bar chart with separate bar for each major trade or operation, identifying first work day of each week.

1.04 SCHEDULE OF VALUES

- A. Submit typed schedule on AIA Form G703; 8-1/2 x 11 inch paper.

- B. Format: Table of Contents of this Project Manual. Identify each line item with number and title of **each Specification Section**.

1.05 SHOP DRAWINGS

- A. Submit the number of opaque reproductions which Contractor requires, plus three copies which will be retained by Architect/Engineer.

1.06 PRODUCT DATA

- A. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.
- B. Submit the number of copies which Contractor requires, plus three copies which will be retained by Architect/Engineer.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.

1.08 SAMPLES

- A. Submit full range of manufacturers' standard colors, textures, and patterns for Architect selection.
- B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.
- C. Include identification on each sample, giving full information.
- D. Submit the number specified in respective Specification section; one will be retained by Architect. Reviewed samples which may be used in the Work are indicated in the Specification Section.

1.09 FIELD SAMPLES

- A. Provide field samples of finishes at Project as required by individual Specifications section. Install sample complete and finished. Acceptable samples in place may be retained in completed Work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

**SECTION 01400
QUALITY CONTROL**

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. General Quality Control.
- B. Workmanship.
- C. Manufacturer's Instructions.
- D. Manufacturer's Certificates.
- E. Manufacturer's Field Services.

1.02 RELATED REQUIREMENTS

- A. Section 01300 - Submittals.

1.03 QUALITY CONTROL, GENERAL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.04 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.06 MANUFACTURERS' CERTIFICATES

- A. When required by individual Specifications Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.07 MANUFACTURERS' FIELD SERVICES

- A. When specified in respective Specification Sections, required manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.
- B. Representative shall submit written report to Architect/ Engineer listing observations and recommendations.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SELECTION AND PAYMENT

- A. The Owner shall engage and pay for the services of an independent testing laboratory to perform inspection and tests of materials and construction as defined in the general conditions, except that in the event of a test failure the contractor shall pay for re-testing.

1.02 COOPERATION OF CONTRACTOR

- A. The contractor shall cooperate with the laboratory and:
 - 1. Make available, without cost, samples of all materials to be tested in accordance with applicable standard specifications.
 - 2. Furnish such nominal labor and sheltered working space as is necessary to obtain samples at the project.
 - 3. Advise the laboratory of the identity of materials sources and instruct the suppliers to allow test or inspections by the laboratory.
 - 4. Notify the laboratory sufficiently in advance of operations to allow for completion of initial tests and assignment of inspection personnel.
 - 5. Notify the laboratory sufficiently in advance of cancellation of required testing operations. The contractor shall be responsible to the laboratory for changes due to failure to notify if requirements for testing are canceled.

1.03 TEST METHODS

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

1.04 TEST REPORTS

- A. The laboratory shall promptly submit written reports of each test and inspection made to the Owner, Architect, Project Manager, Engineer, Contractor, and to any other such party the Owner may specify.

1.05 SCHEDULE OF INSPECTIONS AND TESTS- REFER TO INDIVIDUAL SECTIONS

- A. Section 02300 – Excavation & Backfill of Buildings
- B. Section 02751 – Concrete Paving
- C. Section 02900 – Plumbing
- D. Section 03300 – Cast-In-Place Concrete
- E. Section 03301 – Concrete for General Construction
- F. Section 05120 – Structural Steel
- G. Section 05400 – Cold-Formed Metal Framing

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Electricity, Lighting.
- B. Heat, Ventilation.
- C. Telephone Service & Field Office.
- D. Water.
- E. Sanitary Facilities.
- F. Barriers.
- G. Enclosures.
- H. Protection of Installed Work.
- I. Cleaning During Construction.
- J. Removal

1.02 ELECTRICITY, LIGHTING

- A. Provide power for construction activities.
- B. Provide lighting for construction operations.

1.04 HEAT, VENTILATION

- A. Provide as required to maintain specified conditions for construction operations, to protect materials and finishes from damage due to temperature or humidity.
- B. Prior to operation of permanent facilities for temporary purposes, verify that installation is approved for operation, and that filters are in place. Provide and pay for operation, maintenance.
- C. Provide ventilation of enclosed areas to cure materials, to disperse humidity, and to prevent accumulations of dust, fumes, vapors, or gases. **Use low VOC materials.**
- D. When mechanical systems are operational during construction, mechanical contractor shall protect the system from construction dust and debris and provide final filtering and cleaning at the end of the job.

1.05 TELEPHONE SERVICE, FIELD OFFICE & STORAGE FACILITIES

- A. Provide telephone service to field office/trailer or Contractor's desk in the area during construction. Contractor shall arrange for e-mail service to his superintendent so that he may receive documents promptly.
- B. Office: Weather-tight, with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with furniture: desk, chairs, plan rack, file, telephone as a minimum. Contractor shall maintain construction documents, correspondence and a copy of all corrected and approved shop drawing at this location.
- C. Storage sheds for tools, materials, and equipment:
Weather-tight, with heat and ventilation for Products requiring controlled conditions, with adequate space for organized storage and access, and lighting for inspection of stored materials.

1.06 WATER & PIPING

- A. Contractor shall arrange with **City of Baton Rouge** for water and sewer service for construction use. locate so that water is available by use of hoses. Provide drains and any back flow prevention device necessary.

1.07 SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Locations to be approved by Owner.

1.08 BARRIERS

- A. Provide as required to prevent public entry to construction areas and to provide for Owner's use of adjacent areas and security.
- B. Contractor shall at all times be responsible for insuring the safety of all occupants and users of the building from injury or damage resulting from any contact with the work, workmen, or equipment. Contractor shall be further responsible for the erection of any barricades or partitions to preclude such injury or damage.

1.09 ENCLOSURES

- A. Provide temporary insulated weather-tight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

1.10 PROTECTION OF INSTALLED WORK

- A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
- B. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects, and storage.
- C. Prohibit traffic and storage on waterproofed and roofed surfaces, on lawn and landscaped areas.

1.11 CLEANING DURING CONSTRUCTION

- A. Maintain construction area from accumulation of waste materials and rubbish; regularly dispose of off-site.
- B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.12 REMOVAL

- A. Remove temporary materials, equipments, services, and construction prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities. Restore existing facilities used during construction to specified, or to original, condition.

1.13 TRAFFIC AND PARKING REGULATIONS

- A. Contractors shall limit their staging and parking to designated areas to coordinate with site work contractor.

1.14 PROJECT IDENTIFICATION

- a. Provide 2 - 8 x 12 foot(Or sized as discussed in field) project identification sign of wood frame and exterior grade plywood construction, painted, with exhibit lettering by professional sign painter, to Architect's design and colors. Signs shall also include **color renderings of buildings and written information as provided by the Architect.**
- b. Erect on site at location established by Architect.
- c. Sign Construction:
 - i. Sign Board: 3/4 inch thick DFPA-EXT A-Face plywood.
 - ii. Paint: Exterior grade enamel in colors selected by Architect. (Architect will provide color slide to illustrate.)
 - iii. Supports: 6 x 6 treated wood posts with 2 x 4 treated braces set firmly in ground. (Set below grade 30" minimum.)
- d. **NO OTHER SIGN AGE SHALL BE ALLOWED ON PROJECT SITE UNLESS APPROVED IN ADVANCE BY THE ARCHITECT.**

PART 2- PRODUCTS
Not Used

PART 3 - EXECUTION
Not Used

END OF SECTION

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Products.
- B. Transportation and Handling.
- C. Storage and Protection.
- D. Product Options.
- E. Products Lists.
- F. Equal Products.
- G. Substitutions.
- H. Systems Demonstration.

1.02 RELATED REQUIREMENTS

- A. Instruction to Bidders: Equal Products
- B. Section 01005 - Administrative Provisions.
- C. Section 01400 - Quality Control: Submittal of manufacturers' certificates.
- D. Section 01700 - Contract Closeout: Operation and maintenance data.

1.03 PRODUCTS

- A. Products include material, equipment, and systems.
- B. Comply with Specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.

1.04 TRANSPORTATION AND HANDLING

- A. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.05 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and

legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.06 SUBSTITUTIONS

- A. The name of a certain brand, make, manufacturer, or definite specification is to denote the quality standard of the article desired but does not restrict contractor to the specific brand, make, manufacturer, or specification named. It is to set forth to convey the general style, type, character, and quality of article desired.
- B. Document each request for prior approval with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. Only requests made prior to bidding and **in accordance with Article 3 of the Instructions to Bidders** will be considered.

1.07 SYSTEMS DEMONSTRATION

- A. Prior to final inspection, demonstrate operation of each system to Architect/Engineer and Owner.
- B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Closeout Procedures.
- B. Final Cleaning.
- C. Project Record Documents.
- D. Operation and Maintenance Data.
- E. Warranties and Bonds.
- F. Spare Parts and Maintenance Materials.

1.02 CLOSEOUT PROCEDURES

- A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.

1.03 FINAL CLEANING

- A. Execute prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment. Clean roofs, gutters, down spouts, and drainage systems.
- C. Clean site; sweep paved areas, rake clean other surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site.

1.04 PROJECT RECORD DOCUMENTS- **HARD COPIES AND PDF FORMAT**

- A. Store documents separate from those used for construction.
- B. Keep documents current; do not permanently conceal any work until required information has been recorded.
- C. At Contract closeout, submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.
- D. In addition to the site-maintained record copy, the Contractor shall prepare and furnish to the Owner, thru the Architect **3 sets (3 USB Flash Drives with files in pdf format) of final record drawings** of the completed project. Such drawings shall describe the project as actually built and shall incorporate any changes made during construction.
- E. Final record drawings shall be submitted to the Architect/Engineer at least 10 days prior to substantial completion of the Project.

1.05 OPERATION AND MAINTENANCE DATA

- A. Provide data for:
1. Laminated Finish Custom Casework- Section 06410
 2. Shower Surrounds & Solid Surface Receptors – Section -6610
 3. Solid Polymer Fabrications – Section 06650.
 4. Water Repellent Coating – Section 07175
 5. Building Insulation – Section 07210
 6. Smoke / Firestopping – Section 07215
 7. Sheet Metal Flashing – Section 07600
 8. Caulking & Sealants – Section 07951
 9. Hollow Metal Doors and Frames – Section 08113
 10. Wood Doors – Section 08210
 11. Access Doors – Section 08305
 12. Sectional Overhead Doors – Section 08361
 13. Four-Fold Door Systems – Section 08363
 14. Aluminum Entrances & Storefront - Section 08410.
 15. Finish Hardware - Section 08710.
 16. Glass and Glazing - Section 08800.
 17. Metal Stud Framing System – Section 09111
 18. Gypsum Board Systems – 09260
 19. Tile Setting Materials & Accessories - 09305
 20. Ceramic Tile Floor and Wall Finish - Section 09311.
 21. Suspended Acoustical Ceilings – Section 09511
 22. Resilient Flooring - Section 09650.
 23. Carpeting – Section 09680
 24. Painting – Section 09900
 25. Flagpoles – Section 10350
 26. Fire Extinguisher Cabinets – Section 10520
 27. Pre-Engineered Metal Building Systems – Section 13120
 28. Toilet Room & Housekeeping Accessories - Section 10800.
 29. Mechanical equipment and controls - Division 15.
 30. Electrical equipment and controls - Division 16.
- B. Submit **one set** prior to final inspection, bound in 8-1/2 x 11 inch three-ring side binders with durable plastic covers with table of contents and index tabs for each item and **two sets** of electronic documents in **pdf format on a compact disc or USB flash drive**.
- C. Provide Operation and maintenance instructions, arranged by system. For each system give names, addresses, and telephone numbers of subcontractors and suppliers.
- List:
1. Appropriate design criteria.
 2. List of equipment.
 3. Parts list.
 4. Operating instructions.
 5. Maintenance instructions, equipment.
 6. Maintenance instructions, finishes.
 7. Shop drawings and product data.
 8. Warranties.

1.06 WARRANTIES AND BONDS

- A. Provide duplicate copies. Execute Contractor's submittals and assemble documents executed by subcontractors, suppliers, and manufacturers. Provide table of contents and assemble in

binder with durable plastic cover and **2 USB Flash Drives with information in pdf format.**

- B. Submit material prior to final application for payment.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of Work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 02072
DEMOLITION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Remove existing paving and site structures where noted on drawing and restore remaining portion of drive/streets to remain to match adjacent areas.

1.02 RELATED WORK

- A. Section 01005 - Administrative Provisions
- B. Section 01500 - Construction Facilities and Temporary Controls
- C. Section 01700 - Contract Closeout: Project record documents.

1.03 SUBMITTALS

- A. Submit demolition and removal procedures and schedule under provisions of Section 01300.

1.04 EXISTING CONDITIONS

- A. Conduct demolition to minimize interference with adjacent building areas or utilities. Maintain protected egress and access at all times.
- B. Provide, erect, and maintain temporary barriers and security devices.
- C. Identify existing elements to remain where indicated on construction drawings, if any.

PART 2 - PRODUCTS
Not Used

PART 3 - EXECUTION

3.01 PREPARATION

- A. Erect and maintain temporary barricades to protect adjacent streets (see 01500).
- B. Protect existing items which are not indicated to be altered.

3.02 EXECUTION

- A. Demolish in an orderly and careful manner sawcutting as required for clean break from existing to remain. Protect existing paving.
- B. Immediately remove demolished materials from site.
- C. Do not burn or bury materials on site. Dispose of debris from demolition at approved waste dump areas, to comply with Parish requirements. Upon completion of work, leave areas of work in clean condition.

END OF SECTION

**SECTION 02230
CLEARING AND GRUBBING**

PART 1 - GENERAL

- 1.01 DESCRIPTION:** This item shall consist of clearing and grubbing including the disposal of materials, for all areas within the limits designated on the plans or as required by the Engineer.

Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, downed timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris and rubbish of any nature, natural obstructions of such material which in the opinion of the Engineer is unsuitable to remain beneath the foundation of the proposed construction. Included shall be the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing by burning or otherwise. Any marketable timber shall be the property of the Contractor.

1.02 RELATED WORK

- A. 02300 Excavation and Backfill for Buildings
- B. 02900 Sodding

1.03 REFERENCES (Not Applicable)

1.04 DEFINITIONS (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 RESTRICTIONS ON BURNING

- A. General: Burning operations shall meet all requirements of the Louisiana Department of Environmental Quality, the State Fire Marshal and local fire control agencies.
- B. Outdoor burning, in other than rural park or rural recreation area, of trees, brush, grass and other vegetable matter from such area will be allowable in land clearing and right-of-way maintenance operations so long as the following conditions are met:
 - 1. prevailing winds at the time of the burning must be away from any city or town, the ambient air of which may be affected by smoke from the burning;
 - 2. the location of the burning must be at least 1,000 feet from any dwelling other than a dwelling or structure located on the property on which the burning is conducted;
 - 3. care shall be used to minimize the amount of dirt on the material being burned;
 - 4. heavy oils, asphaltic materials, items containing natural or synthetic rubber, or any materials other than plant growth which produce unreasonable amounts of smoke may not be burned; nor may these substances be used to start a fire;
 - 5. the burning may be conducted only between the hours of 8 a.m. and 5 p.m. Piles of combustible material should be of such size to allow complete reduction in this time interval; and
 - 6. the burning must be controlled so that a traffic hazard is not created.

- 3.02 LAYOUT OF WORK:** Layout of work will be as specified in the General Requirements of these specifications.

- 3.03 CLEARING:** The areas to be cleared shall be completely stripped of all trees, logs, stumps, brush, vegetation, rubbish or other perishable or objectionable matter. Such individual trees as the Engineer may designate or mark within any clearing area shall be left standing and uninjured. All trees not required to be moved shall be carefully protected.

Material without value shall be piled in the limits of the right-of-way or easement and burned or otherwise disposed of in such a manner as not to injure any trees or other property on the right-of-way or abutting property.

Trees, brush, stumps, etc., not burned shall not be deposited on adjacent lands, but shall be disposed of lawfully in spoil areas obtained by the Contractor.

It shall be the Contractor's responsibility to remove, load, haul, and dump all materials required to make the right-of-ways and sites ready to construct the facilities as planned.

3.04 GRUBBING: All stumps, roots, and other objectionable materials within the area designated for clearing and grubbing shall be removed and disposed of.

The Contractor shall root rake the entire area within the limits shown on the plans. All tubular roots from any palmetto plants on the site shall be removed before any embankment work commences.

PART 4 - MEASUREMENT AND PAYMENT

4.01 CLEARING AND GRUBBING

- A. Measurement:** No measurement will be made for clearing and grubbing work as a separate item, but shall be included in other items as specified.
- B. Payment:** Clearing and Grubbing payment will be paid for in the various bid items as specified.

END OF SECTION 02230

SECTION 02281
TERMITE CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Soil treatment below slabs-on-grade for subterranean insects.
- B. Soil treatment at interior and exterior foundation perimeter, for subterranean insects.

1.02 RELATED WORK

- A. Section 02200 - Backfilling: Backfill materials.

1.03 REFERENCES

- A. EPA - Federal Insecticide, Fungicide and Rodenticide Act.

1.04 QUALITY ASSURANCE

- A. Applicator: shall be licensed and bonded within the State of Louisiana per State Statutes.
- B. Applicator: Company specializing in soil treatment for termite control.
- C. Materials: Provide certification that toxicants conform to requirements of authority having jurisdiction.
- D. Material Packaging: Manufacturer's labels and seals identifying content.

1.05 REGULATORY REQUIREMENTS

- A. Conform to State of Louisiana requirements for application licensing and authority to use toxicant chemicals.

1.06 PRODUCT DATA

- A. Submit product data under provisions of Section 01300.
- B. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rate.
- C. Submit manufacturers installation instructions under provisions of Section 01300.

1.07 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700.
- B. Accurately record moisture content of soil before treatment, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.08 WARRANTY

- A. Provide five year warranty for material and installation under provisions of Section 01700.
- B. Warranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites; repairs to building or building contents so caused.

- C. Inspect work annually and report in writing to Owner.
- D. Owner reserves right to renew warranty for an additional year after initial 5 year warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Cyper TC Insecticide, by Control Solutions, Inc. 5903 Genoa-Red Bluff Rd, Pasadena, TX 77507
- B. Demon, by Zeneca
- C. Prevail, by FMC
- D. Dursban T-C - Dow Elanco
- E. Tenure - DowElanco
- F. Dragnet FT - FMC
- G. Tribute - AgrEvo
- H. Durban 75WG- DowAgro Sciences
- I. Prelude (Torpedo) - Zeneca
- J. Substitutions: Under provisions of Section 01600 and Instructions to Bidders, Article 4.3 Substitutions.

2.02 MATERIALS

- A. Toxicant Chemical: Waterbased emulsion, uniform composition, synthetic dye to permit visual identification of treated soil, of the generic chemical chlorpyrifos.

2.03 MIX DILUTION

- A. Dilute toxicant chemical in accordance with manufacturers recommendations.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.
- B. Beginning of application means acceptance of soil conditions.

3.02 APPLICATION

- A. Apply toxicant immediately prior to installation of vapor barrier under slab-on-grade or finish grading outside foundation walls.
- B. Apply toxicant in accordance with manufacturer's labeling instructions.
- C. Apply extra treatment to structure penetrations, pipe, ducts, and other soil penetrations.
- D. Apply as a coarse spray to ensure uniform distribution.

- E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil. Retreat disturbed treated soil.
- F. Within 12 months after initial treatment of the outside of the foundation, the perimeter shall be trenched and treated as required by label and labeling. The licensee shall report the completion of the application to the outside of the foundation, to **the Louisiana Department of Agriculture and Forestry** on the Termite Perimeter application form. Rodding will be acceptable where trenching may damage flowers and/or shrubs. Maximum distance between rod holes shall be 4 inches.

3.03 RETREATMENT

- A. If inspection identifies the presence of termites, retreat soil and retest.
- B. Use same toxicant as for original treatment.

END OF SECTION

**SECTION 02300
EXCAVATION AND BACKFILL FOR BUILDINGS**

PART 1 - GENERAL

1.01 DESCRIPTION: This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required for building construction, drives, parking, drainage or other purposes in accordance with these specifications and in conformity to the dimensions and typical section shown on the plans.

1.02 RELATED WORK

A. 02230 Clearing and Grubbing

1.03 QUALITY ASSURANCE

A. **Codes and Standards:** Perform earthwork complying with requirements of authorities having jurisdiction.

B. **Testing and Inspection Service:** The Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing. The Contractor shall coordinate his work with the laboratory and cooperate in the performance of the testing work.

PART 2 - MATERIALS

2.01 SOIL MATERIALS

A. **General:** Provide approved soil materials from off-site when sufficient approved soil materials are not available from excavations.

B. **Select Fill:** Imported select material shall be an AASHTO A-2-4 through A-2-6 classification with a Plasticity Index (PI) less than 20. The material shall be placed in 10" thick loose lifts and compacted to 95% of standard Proctor density when tested in accordance with AASHTO T99.

PART 3 – EXECUTION

3.01 GENERAL: Before beginning excavation, grading, and embankment operations in any area, the area shall be completely cleared and grubbed in accordance with Section 31 11 00 of these specifications.

The suitability of material to be placed in embankments shall be subject to approval by the Engineer. All unsuitable material shall be disposed of in waste areas on-site as directed by the engineer. All waste areas shall be graded to allow positive drainage of the area and of adjacent areas. The surface elevation of waste areas shall not extend above the surface elevation of adjacent usable areas, unless specified on the plans or approved by the Engineer.

Those areas outside of paved areas in which the top layer of soil material has become compacted by hauling or other activities of the Contractor shall be scarified and disked to a depth of 4 inches.

3.02 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. Provide erosion control measures to prevent erosion or displacement of soils and discharges of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Select fill limits shall extend a minimum of five (5) feet outside the building's limits.

3.03 DEWATERING

- A. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding the project site. Pump, bail or grade these areas to provide positive drainage and protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.04 EXCAVATION

- A. Excavate to the indicated elevations and dimensions within a tolerance of plus or minus 0.10 foot. Extend the excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction.
- B. Do not disturb the bottoms of excavations. Excavate by hand to final grade prior to placing concrete reinforcement. Trim bottoms to required lines and grades to leave a solid base to receive other work.
- C. No excavation shall be started until the work has been staked out by the Contractor and the Engineer has been consulted regarding the elevations and measurements of the ground surface. All suitable excavated material shall be used in the formation of embankment, subgrade, or for other purposes shown on the plans.
- D. When the volume of the excavation exceeds that required to construct the embankments to the grades indicated, the excess shall be used to grade the areas of ultimate development, or disposed of as directed. When the volume of excavation is not sufficient for constructing the fill to the grades indicated, the deficiency shall be obtained from borrow areas.
- E. Site grading shall be maintained so that the surface is well drained at all times. When necessary, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the work.

3.05 SUBGRADE

- A. Preparation of the building area subgrade shall be as follows:
 - 1. Remove existing pavement, topsoil and waste in a manner acceptable to project Owner. Replace with select fill as stated herein.
 - 2. Scarify the exposed subgrade a minimum of six inches in depth and recompact to the density specified below.
 - 3. Maintain the moisture content of the existing subgrade soil to a tolerance of 2% below to 2% above the theoretical optimum moisture content.
 - 4. Compact the existing subgrade to 95% of the density defined by ASTM D 698 (Standard Proctor).

3.06 APPROVAL OF SUBGRADE

- A. Notify the Engineer or his representative when excavations have reached the elevation of the required subgrade.

If the Engineer or his representative determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or select fill material as directed. Additional excavation and replacement material will be paid according to the Contract provisions for changes in work. Wet soil that is suitable for subgrade shall be dried and compacted without replacement at no direct pay.

- B. Reconstruct subgrades damaged by weather conditions or construction activities, as directed by the Engineer.

3.07 UNAUTHORIZED EXCAVATION: Fill unauthorized excavation under foundations or wall footings by extending the indicated bottom elevation of concrete foundations or footings to the excavation bottom without altering the required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Engineer. Fill unauthorized excavations under other construction as directed by the Engineer.

3.08 STORAGE OF SOIL MATERIALS: Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust and saturation due to rainfall. Stockpile soil materials away from the edge of excavations.

3.09 PLACEMENT OF SELECT FILL

- A. Placement and compaction of select fill:

1. Place select fill on tested and accepted compacted subgrade in thin loose lifts not to exceed eight inch thickness.
2. Maintain moisture content of select fill soil within 2% below and 2% above its theoretical optimum moisture content.
3. Compact each lift to 95% of the density defined by ASTM D 698 (Standard Proctor) for the select fill soils.

- B. Maintain adequate drainage of the disturbed areas during construction to reduce moisture fluctuations in the subgrade. Such measures may include ditches, sumps and/or well points.

3.10 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:

1. Obtain the Engineer's acceptance of construction below finished grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
2. Concrete formwork removal.
3. Removal of trash and debris from excavation.
4. Removal of temporary shoring, bracing, and sheeting.

- B. Compact backfill to 95% standard proctor density at all areas below paving.

3.11 GRADING

- A. Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

- B. Finish the building subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.12 FIELD QUALITY CONTROL

- A. Allow the independent testing laboratory to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
- B. When testing agency reports that subgrades, fills, or backfills are below the specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

- 3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS:** Transport surplus satisfactory soil to designated on-site storage areas. Stockpile or spread soil as directed by Engineer. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off-site.

PART 4 - MEASUREMENT AND PAYMENT

- 4.01 EXCAVATION AND BACKFILL:** No separate measurement or payment will be made for excavation and backfill. All materials and labor associated with this work shall be included in the price bid for associated items of work.

END OF SECTION 02300

**SECTION 02510
WATER DISTRIBUTION SYSTEM**

PART 1 - GENERAL

1.01 DESCRIPTION

This item shall consist of water pipe and fittings, together with fire hydrants, valves, valve boxes, etc. necessary to construct the water distribution system for the project. Included shall be the furnishing and installation of all materials, testing and disinfecting, in accordance with these specifications and in conformity with the lines and grades given.

This item shall include, in the bid prices per unit requested, the cost of common excavation and backfill, the cost of furnishing and installing all trench bracing, and the material for and the making of all joints.

1.02 LOCATION OF LINES

The approximate location of lines, valves, fire hydrants, etc., has been indicated on the plans as being within the street, highway or easement rights-of-way. Final locations of the various items of construction shall be established in the field by the Engineer. Any location within said street, etc. may be used.

All costs not specifically listed as a pay item shall be included in the price bid for the item of which the costs are a part.

1.03 LAYOUT OF WORK

Layout of work will be as specified in the General Requirements of these specifications.

1.04 REFERENCE STANDARDS: References shall mean the latest revision of the following standards:

- | | | |
|-----------|-------------------------------|---|
| A. | AASHTO M 36 ----- | Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains |
| B. | AASHTO M 190 ----- | Standard Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches |
| C. | AASHTO T 99----- | Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop |
| D. | AASHTO T 180 ----- | Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop |
| E. | ANSI/AWS D10.7M/D10.7 ----- | Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe |
| F. | ANSI/AWWA C104/A21.4----- | Cement-Mortar Lining for Ductile-Iron Pipe and Fittings |
| G. | ANSI/AWWA C105/A21.5----- | American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems |
| H. | ANSI/AWWA C110/A21.10 ----- | Ductile-Iron and Gray-Iron Fittings for Water |
| I. | ANSI/AWWA C111/A21.11 ----- | Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings |
| J. | ANSI/AWWA C115/A21.15-05----- | Standard for Flanged Ductile-Iron Pipe With Threaded Flanges |
| K. | ANSI/AWWA C150/A21.50 ----- | Thickness Design of Ductile-Iron Pipe |

- L.** ANSI/AWWA C151/A21.51 ----- American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
- M.** ANSI/AWWA C153/A21.53 ----- Ductile-Iron Compact Fittings for Water Service
- N.** ANSI/AWWA C200 ----- Steel Water Pipe - 6 in. (150 mm) and Larger
- O.** ANSI/AWWA C206 ----- Field Welding of Steel Water Pipe
- P.** ANSI/AWWA C502 ----- Dry-Barrel Fire Hydrants
- Q.** ANSI/AWWA C504 ----- Rubber-Sealed Butterfly Valves
- R.** ANSI/AWWA C509 ----- Resilient-Seated Gate Valves for Water-Supply Service
- S.** ANSI/AWWA C515 ----- Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
- T.** ANSI/AWWA C600 ----- Installation of Ductile-Iron Water Mains and Their Appurtenances
- U.** ANSI/AWWA C651 ----- AWWA Standard for Disinfecting Water Mains
- V.** ANSI/AWWA C700 ----- AWWA Standard for Cold-Water Meters-Displacement Type, Bronze Main Case
- W.** ANSI/AWWA C800 ----- AWWA Standard for Underground Service Line Valves and Fittings
- X.** ANSI/AWWA C900 ----- AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. for Water Distribution
- Y.** ANSI/AWWA C901 ----- AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in. for Water Service
- Z.** ANSI/AWWA C906 ----- AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 in. (100 mm) through 63 in. (1,575 mm), for Water Distribution and Transmission
- AA.** ANSI/AWWA C909 ----- Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 in. through 24 in. for Water Distribution
- BB.** ASTM D1599 ----- Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic, Pipe, Tubing, and Fittings
- CC.** ASTM D1784 ----- Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
- DD.** ASTM D1785 ----- Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
- EE.** ASTM D2241 ----- Standard Specification for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

FF.	ASTM D2464 -----	Standard Specification for Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
GG.	ASTM D2466-----	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
HH.	ASTM D2467-----	Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
II.	ASTM D2564-----	Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Piping Systems
JJ.	ASTM D2672 -----	Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement
KK.	ASTM D2855-----	Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings
LL.	ASTM D3036 -----	Standard Specification for Socket-Type PVC Plastic Line Couplings
MM.	ASTM D3139 -----	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
NN.	ASTM F477 -----	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
OO.	LADOTD 1007.03 -----	Standard Specification for Bituminous Coated Corrugated Steel Underdrain Pipe
PP.	LADOTD TR 401 -----	The Determination of In-Place Density
QQ.	LADOTD TR 418 -----	Moisture-Density Relationships
RR.	International Building Code, Chapter 29-Plumbing Systems	
SS.	International Residential Code, Part VII-Plumbing	
TT.	International Plumbing Code	

1.05 RELATED WORK

03 30 10 – Concrete for General Construction

PART 2 – MATERIALS

2.01 GENERAL

The pipe and other materials shall be of the type called for on the plans, in the Bid Form and/or in the General Requirements.

All materials in contact with potable water shall meet the reduced lead requirements of Parts XII (Water Supplies) and XIV (Plumbing) of LAC Title 51 (Sanitary Code).

2.02 UNIFORM MATERIAL TYPES

Each type of material, such as pipe, valves, fittings, hydrants, service assemblies, etc., shall be supplied by a single manufacturer throughout the project. Once he begins the project with material of a given type, the Contractor shall complete the project, including all change orders, with material of the original type unless otherwise approved by the Engineer.

2.03 PIPE SHIPPING AND DELIVERY

The pipe manufacturer shall take the necessary steps in handling and shipping the pipe as not to injure the pipe, coating, or lining. Each joint of ductile iron pipe shall be individually stacked on the truck or railroad car bed with adequate support under each joint of pipe and adequate support and protection between each layer of pipe stacked on the vehicle. The entire stack shall be adequately and securely fastened to the truck or rail bed to prevent unnecessary vibrations, movements and stresses in the pipe during transportation.

Polyvinyl chloride plastic pipe (P.V.C.) shall be stacked into bundles (sized that the Contractor can unload one bundle at a time) and the bundle shall be securely banded together with adequate wood boards around the bundle to protect it during shipment. The bundles shall then be stacked on the truck or rail bed for shipment to the job site. The load of bundles shall be securely attached to the shipping bed to prevent unnecessary stresses during transportation. Smaller sizes of P.V.C. pipe may be placed inside larger diameter pipe which is bundled as specified above.

2.04 HANDLING OF ALL PIPE

The Contractor shall handle all pipe with handling and hauling equipment as not to injure the pipe, pipe lining, or pipe coating. Any pipe pushed off the truck bed will be rejected. Adequate equipment shall be used by the Contractor to remove the pipe from the truck bed and string it along the trench location.

If the pipe is to be stockpiled before it is strung along the trench the Contractor shall stack the pipe on a level site in neat stacks. Ductile iron pipe shall be stacked using the timber supports which were used in transporting the pipe. P.V.C. pipe shall be stacked in the bound bundles that the pipe was shipped in and the bundles shall not be broken up until the stringing operation is started.

2.05 DUCTILE IRON PIPE, JOINTS, FITTINGS

A. Ductile Iron Water Pipe: Ductile iron water pipe shall conform in all respects to ANSI/AWWA C 150/A21.50 and ANSI/AWWA C 151/A21.51 standards. The iron shall be fully annealed Grade 60-42-10. The exterior shall have standard coal tar coating. The interior shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4. Unless otherwise indicated on the plans, Bid Form and/or Specifications, the minimum pressure class for the push-on pipe shall be 350 psi for 3" through 24" diameter, 300 psi for 30" through 42" diameter, and 250 psi for 48" through 64" diameter. 3" through 12" M.J. pipe shall be Class 53.

B. Pipe Joints:

1. Push-on and Mechanical Joints: Push-on joints shall be used unless otherwise indicated on the plans, Bid Form, and/or Specifications. Push-on and mechanical joints shall meet the requirements of the latest revision of ANSI/AWWA C111/A21.11.
2. Restrained Joints: Restrained joints shall be "Fastite" with "Fast-Grip" gaskets as manufactured by American Cast Iron Pipe Company or "Tyton" joint with "Field Lok 350" gaskets by US Pipe & Foundry Company, or an approved equal.

Restrained joints that are subject to movement or vibration in service shall utilize a locking ring feature. Locking ring restrained joints shall be "Flex-Ring" as manufactured by American Cast Iron Pipe Company, "TR-Flex" as manufactured by US Pipe & Foundry Company, "Super-Lock" as manufactured by Clow Water Systems Company, or approved equal.

All means of joint restraint shall be as provided or as recommended by the pipe manufacturer and shall be installed in accordance with the manufacturer's written instructions.

3. **Flexible Joints:** Bolt-on type ball and socket flexible joints shall be as manufactured by American Cast Iron Pipe Company, US Pipe, or an approved equal. Bolts shall be stainless steel conforming to ASTM A296, Grade CA-15.

Boltless type ball and socket flexible joints shall be as manufactured by James B. Clow and Sons, Inc., American Cast Iron Pipe Company, or an approved equal. These joints shall provide a minimum of 15 degrees of deflection per joint.
- C. **Fittings:** Fittings for ductile iron pipe shall be ductile iron fittings conforming to the latest revisions of ANSI/AWWA C110/A21.10 (3" through 48"), or ANSI/AWWA C153/A21.53 (3" through 64"). Fittings shall be pressure rated equal to or greater than the pipe on which they are installed.

Fittings shall be coal tar coated and cement mortar lined in accordance with ANSI/AWWA C104/A21.4.

Fittings shall be of a joint type identical to the joints of the pipe on which they are installed, except that M.J. fittings may be used with push-on joint pipe.
- D. **Bolts, Nuts, Gaskets, Etc.:** Bolts, nuts, gaskets, etc. shall be as specified by the applicable ANSI specification for bolted joints or as recommended by the pipe manufacturer; all subject to the approval of the Engineer. All bolts on flanged or mechanical joint pipe installed underground shall be made from a non-corrosive metal subject to the approval of the Engineer.

2.06 FLANGED DUCTILE IRON PIPE AND FITTINGS

- A. **Flanged Pipe:** Flanged pipe shall conform to the latest revised requirements of ANSI/AWWA C115/A21.15. Pipe thickness shall be as shown on the plans, on the bid form, and/or in the Specifications, and shall have a minimum working pressure of 250 psig unless otherwise specified. Pipe shall be cement mortar lined in accordance with the latest revision of ANSI/AWWA C104/A21.4.
- B. **Flanged Fittings:** Flanged fittings shall be cast or ductile iron conforming to the latest revised requirements of ANSI/AWWA C110/A21.10 for sizes 3" through 48".

Fittings shall be cement mortar lined in accordance with the latest revision of ANSI/AWWA C104/A21.4. Fittings pressure rated at a minimum of 250 psig shall be used unless otherwise specified. Companion flanges shall be Class 125 meeting the latest revised requirements of ANSI/AWWA C115/A21.15

2.07 P.V.C. PIPE, JOINTS, FITTINGS (SDR) (PR)

- A. **Pipe:** All polyvinyl chloride (PVC) pipe which is specified by Standard Dimension Ratio (SDR) or pressure rating class (PR) shall conform to ASTM D 2241. SDR PVC pipe shall be extruded from clean virgin resin which conforms to ASTM D 1784, Class 12454-B (PVC 1120). PVC pipe shall have an integral bell with a locked in gasket.

All pipe shall have the manufacturer's trade name, the NSF seal of approval, the SDR, the internal pressure rating, and ASTM designation D 2241 conspicuously marked on each length of pipe. Pipe shall be SDR 26 unless otherwise specified.
 1. **Class 160:** SDR 26 PVC pipe shall have a minimum internal pressure rating of 160 psig @ 73° F.
 2. **Class 200:** SDR 21 PVC pipe shall have a minimum internal pressure rating of 200 psig @ 73° F.
- B. **Joints:** Unless otherwise specified, integral bell push-on type joints shall be furnished.
 1. **Bell End Push-On Joints:** Integral bell end push-on joints having one elastomeric gasket per joint of pipe shall comply with ASTM D3139 and ASTM F477.

2. Solvent Cement Bell Ends: Solvent weld joints will be allowed only where specifically shown on the plans or called for in the bid form. Where allowed, solvent cement bell pipe joints shall conform to ASTM D 2672.

- C. Fittings: Ductile iron fittings shall be used on pipe sizes 6" and larger. PVC fittings shall be used on pipe 4" and smaller. PVC fittings shall be made from the same resin type meeting ASTM D 1784 as the pipe resin. PVC fittings shall be marked with the NSF seal of approval.

Fittings shall be pressure rated equal to or greater than the pipe on which they are installed.

The wall thickness of PVC fittings shall be such that the SDR of the fitting at any point shall not exceed the SDR of the pipe. Fittings shall be of a joint type identical to the joints of the pipe on which they are installed.

1. Ductile Iron Push-On Fittings: Ductile iron push-on fittings shall comply with applicable portions of ANSI/AWWA C153/A21.53 (3" through 64") or C110/A21.10 (3" through 48") and C111/A21.11 and shall be coal tar coated and cement mortar lined in accordance with ANSI A21.4.
2. Ductile Iron Mechanical Joint Fittings: Ductile iron mechanical joint fittings shall comply with ANSI/AWWA C153/A21.53 (3" through 64") or ANSI/AWWA C110/A21.10 (3" through 48") and ANSI A21.11 and shall be coal tar coated and cement mortar lined in accordance with ANSI A21.4.
3. PVC Push-On Fittings: PVC push-on fittings shall comply with ASTM D3139, ASTM D 1599, and ASTM F-477.
4. PVC Solvent Cement Fittings: PVC solvent cement fittings, where allowed, shall be SCH 40 complying with ASTM D 2466, or SCH 80 complying with ASTM D 2467.

- D. Solvent Cement: PVC solvent cement shall comply with ASTM D 2564 and shall be recommended by and supplied by the manufacturer of the pipe on which it is used.

2.08 SCHEDULE 40 AND 80 PVC PIPE JOINTS AND FITTINGS

- A. Schedule 40 and 80 PVC Pipe: PVC pipe which is specified by schedule number shall comply with ASTM D 1785. PVC pipe shall be extruded from clean virgin resin which conforms to ASTM D 1784, Class 12454-B (PVC 1120). All pipe shall be marked at intervals not less than 5 feet with manufacturer's name or trade mark, the NSF seal of approval, the schedule number and the ASTM designation D 1785. Pipe shall be SCH 40 unless otherwise specified.
- B. Pipe Joints: Below-ground joints shall be gasketed as specified in Paragraph 2.09(B) unless specifically indicated otherwise. Above-ground joints shall be solvent cement unless otherwise specified.
- C. Fittings: Fittings shall be as specified in Paragraph 2.09(C) of this specification with the exception that threaded PVC fittings will be acceptable. Fittings shall be pressure rated equal to or greater than the pipe on which they are installed.

Schedule 40 PVC solvent cement fittings shall comply with ASTM D 2466. Schedule 80 PVC solvent cement fittings shall comply with ASTM D 2467. Threaded fittings shall be Schedule 80 and shall comply with ASTM D 2464.

2.09 AWWA PVC PIPE, JOINTS AND FITTINGS

- A. AWWA PVC Pipe: All PVC pipe which is specified by AWWA pressure class shall conform to AWWA C900 (4" through 60") latest edition. If specifically called for on the Plans, in the Specifications or on the Bid Form, pipe may be AWWA C909 (4" through 16").

Pipe shall be as specified on the plans, Bid Form, or in the Specifications. Unless otherwise indicated, AWWA C-900 and C-909 PVC pipe shall be DR 18 Class 235 cast iron pipe size (CL 235 CIPS). Unless specifically allowed by the Engineer, the Contractor shall not use both C900 and C909 pipe on the same project.

All pipe shall be marked at intervals not less than five feet with the manufacturer's name or trade mark, the NSF seal of approval, the nominal size and OD base, PVC, the dimension ratio, pressure class and the AWWA designation number.

- B. Pipe Joints:** Pipe joints complying with AWWA C 900 and C909 shall be the integral wall-thickened bell type.
- C. Fittings:** Fittings shall be ductile iron push-on type or mechanical joint type complying with ANSI/AWWA C153/A21.53 (3" through 64") or ANSI/AWWA C110/A21.10 (3" through 48") and ANSI A21.11.

Fittings shall be coal tar coated and cement mortar lined in accordance with ANSI A21.4. Fittings shall be pressure rated equal to or greater than the pipe on which they are installed.

2.10 COLOR CODING OF PVC WATER MAINS

Unless otherwise indicated on the Plans or specified in the Bid Form or Specifications, PVC water piping shall be pigmented blue in color for positive identification as water piping. White pipe shall be allowed, provided 3-inch "Water" marking tape is installed directly above the pipe. When marking tape is used, it will not take the place of the required locator wire. Green pipe shall not be used for water applications.

2.11 HIGH-DENSITY POLYETHYLENE PIPE, JOINTS AND FITTINGS

- A. HDPE Pipe:** Polyethylene water pipe shall be PE 4710 manufactured in accordance with AWWA C906, having a minimum cell classification of P.E. 345464C in accordance with ASTM D3350. HDPE pipe shall be manufactured from virgin resin. HDPE water mains shall be Ductile Iron Pipe Size, SDR-11 unless otherwise specified in the project plans, bid form, or Specifications.

All HDPE pipe shall be of a single manufacturer and shall be marked as required by AWWA C906 and shall bear the NSF seal of approval for potable water service. HDPE pipe shall be black in color with a blue stripe or similar markings to indicate potable water service.

- B. Joints:** Pipe shall be joined into continuous lengths on the jobsite, aboveground using butt heat-fusion or electro fusion equipment and instructions provided by or recommended by the pipe manufacturer. Equipment shall be capable of meeting all temperature, pressure and alignment conditions recommended by the manufacturer. All fusion machine operators shall be certified by the pipe manufacturer. Butt fusion joining shall be 100% efficient and shall produce a joint weld strength equal to or greater than the tensile strength of the pipe.
- C. Fittings:** Fittings shall be ductile iron push-on type or mechanical joint type complying with ANSI/AWWA C153/A21.53 (3" through 64") or ANSI/AWWA C110/A21.10 (3" through 48") and ANSI/AWWA C111/A21.11.

Fittings shall be coal tar coated and cement mortar lined in accordance with ANSI A21.4. Fittings shall be pressure rated equal to or greater than the pipe on which they are installed.

Transition fittings required at pipe material changes shall be the Harvey type mechanical joint adapter. Transition fittings shall be of the same DR as the pipe, shall exceed the tensile strength of the pipe, and shall comply with AWWA C-906.

2.12 POLYETHYLENE SERVICE PIPE AND TUBING 3/4" THROUGH 3"

Service pipe and tubing size 3/4" through 3" shall be PE 4710 and shall comply with AWWA C901. Pipe and tubing shall be NSF approved and shall comply with the International Plumbing Code. Service tubing size basis shall match the Owner's existing service tubing, if applicable. Unless, specifically indicated, the Contractor shall verify the Owner's existing service tubing size basis prior to ordering tubing.

- A. **O.D. Base P.E. Tubing:** Unless otherwise indicated, service lines shall be O.D. base P.E. pressure tubing, DR 9.0, pressure Class 200 psi, copper tubing size (CTS), or iron pipe size (IPS), as required.
- B. **I.D. Base P.E. Pipe:** Where specifically shown on the plans or called for on the bid form, service lines shall be I.D. base P.E. pressure pipe, DR 7.0, pressure Class 200 psi.
- C. **Insert Stiffeners:** Service pipe and tubing ends to be installed with compression type fittings and connections shall be fitted with a stainless steel insert stiffener of the correct size for the service pipe or tubing.

2.13 SERVICE ASSEMBLY THRU 1"

The service assembly shall consist of the service saddle, corporation stop, meter stop, meter, meter coupling, and meter box.

- A. **Service Saddles:** Service saddles shall be all brass or bronze and shall be the following or an equal approved by the Engineer:

Main Size & Type	Mueller	Ford
SDR PVC 2"-6"	H 13420 thru H 13431	S70-253 thru S70-603
SDR PVC 8"	H 13433	S70-803
C.I., or CIPS PVC 4"-12"	H 13440 thru H 13444	S90-403 thru S90-1203

- B. **Corporation Stops:** Corporation stops shall be the ball valve type, rated for working pressures of 300 psi, and constructed in accordance with AWWA C800. Corporation stops shall have AWWA corporation stop threads and a tubing connection similar to Ford's "Pack Joint", sized to fit the specified service line tubing. Corporation stops shall be Mueller 300 series, Ford Meter Box Company, or approved equal.
- C. **Meter Stops:** Meter stops shall be the ball valve type constructed of heavy cast bronze with a one-piece head and stem. Valves shall be rated for a working pressure of 300 psi and shall comply with AWWA C800. Connections shall be made using a connection similar to Ford's "Pack-Joint". Meter stops shall be Mueller 300 series, Ford Meter Box Company or an equal approved by the Engineer.
- D. **Water Meter:** All water service meters shall comply with AWWA C 700 and shall be of the same make and manufacture.

The meter shall be of the magnetic drive hermetically sealed register with disc or piston type design. The register shall be of the odometer type reading in U.S. gallons, complete with test index circle with a heat treated glass. The meter shall have an all bronze housing with bronze housing bolts, and a bronze hinged register cover. When the meter furnished requires special keys to remove the register, two keys shall be furnished to the Owner. All meters shall be accurate when operating at the following flow rates:

Meter Size (inches)	Safe Operating Capacity (G.P.M.)
5/8 X 3/4	20
3/4	30
1	50
1 x 1 1/4	50
1 1/2	100

- E. **Meter Couplings**: Meter couplings shall be Mueller #H 10890 or Ford #C38-23-2 (3/4") or C38-44-2 (1")
- F. **Meter Box**: Meter boxes shall be one of the following types at the option of the Contractor unless otherwise specified. Meter box lids shall be furnished without locks.
1. **Cast Iron Meter Box**: Cast iron meter boxes shall be Ford Meter Box Company, East Jordan Iron Works, or an approved equal as follows:

Meter Size	Cast Iron Meter Box
5/8" x 3/4"	Ford "Yokebox" YL161-233
3/4"	Ford "Crescent Box" #CB111-333
1"	Ford "Crescent Box" #CB111-444

2. **Concrete Meter Box**: Concrete meter boxes shall be as manufactured by Southern Meter Box, Inc., East Jordan Iron Works, or an approved equal as follows:

Meter Size	Concrete Meter Box
3/4"	CH 5/8 x 3/4
1"	CH 1
2"	CH 2

Concrete meter boxes shall have a reinforced concrete cover with a cast iron reading lid hinged to cover with a brass or steel pin.

3. **Plastic Meter Box**: Plastic meter boxes shall be as manufactured by NDS Inc., DFW Plastics Inc., or an approved equal, shall be equipped with a plastic iron reading lid and shall be as follows:

Meter Size	NDS Plastic Meter Box
3/4"	Model D 1200
1"	Model D 1500

2.14 SERVICE ASSEMBLY LARGER THAN 1"

Service assemblies larger than 1" shall be as detailed on the Drawings, Specifications or Bid Form.

2.15 SERVICE ASSEMBLIES WITH REGULATOR

The service assemblies with regulator shall consist of the service assembly specified in Paragraph 2.13 with the pressure regulator installed after the meter and inside the meter box. The meter box shall be at least 17" long.

A. **Service Assemblies with Regulator (Thru 1")**:

1. **Service Assembly**: The service assembly shall be as specified in Paragraph 2.13.
2. **Service Regulator with Strainer**: Service regulator shall be Watts N35BU-Z6 with stainless steel strainer, or an equal approved by the Engineer. Regulators shall comply with the International Plumbing Code, latest revision and shall be suitable for meter box installation. Unless otherwise specified pressure regulators shall be set at 50 psi.

B. **Service Assemblies with Regulator (Larger Than 1")**:

Service assemblies with regulator larger than 1" shall be as detailed on the Drawings, Specifications, or Bid Form.

2.16 TAPPING SLEEVES

Tapping sleeves shall be cast iron or stainless steel and shall be rated for a 200 psig working pressure as follows or approved equal:

	Mueller	Clow	Smith Blair
<u>Cast Iron:</u>			
For CI or CIPS PVC	H 615	F 5205	-
For SDR PVC	-	F 6342	-
<u>Stainless Steel:</u>			
For CI or CIPS PVC	H 305	-	663
For SDR PVC	H 305	-	663

Stainless steel tapping sleeves shall have stainless steel outlet flanges and shall be equipped with $\frac{3}{4}$ " NPT stainless steel test plugs. All nuts, bolts and flanges shall be equipped with insulating gaskets.

2.17 GATE VALVES AND TAPPING VALVES

- A. General:** All gate valves and tapping valves shall be manufactured in compliance with Standard C509 or C515 of the American Water Works Association, or the latest revision thereof. Valves shall be the resilient seat type, shall have non-rising stems and shall be Mueller 2360 series, American Flow Control 2500 Series or an equal approved by the engineer.

All gate valves shall operate so that the valve will open when turning the operating nut in a counter-clockwise direction. All gate valves buried underground shall have a non-rising stem with operating nut and cast iron valve box. All gate valves shall be designed for a minimum working pressure of 250 pounds per square inch and shall be capable of withstanding an internal hydrostatic pressure of 500 pounds per square inch. Buried gate valves shall have stems equipped with the standard (2" square) wrench nut. Gate valves installed above ground shall be equipped with hand wheels. One (1) valve wrench suitable to open and close all gate valves in this project shall be supplied to the Owner.

- B. Gate Valve 1-1/2" and Smaller:** Gate valves 1-1/2 inches or smaller shall be iron body, with bronze trim or bronze body. The valves shall be of the screwed end type.
- C. Gate Valves 2 to 20 Inches:** Gate valves 2 to 20 inches inclusive shall be installed in an upright position and shall have mechanical joint or push-on ends unless otherwise specified.
- D. Gate Valves 24 Inches and Larger:** Gate valves 24" and larger shall have spur or bevel gearing as indicated on the plans or in the Specifications or Bid Form. Valves shall be installed to accommodate the gearing.

2.18 CHECK VALVES

- A. General:** All check valves shall be of the type shown on the plans and shall conform to the following specifications. Check valves shall be the standard swing check type unless otherwise noted.
- B. Standard Swing Check Valve:** All standard swing type check valves shall be equipped with an external lever and weight unless otherwise specified. All standard swing type check valves shall be Mueller A-2606 series, Clow F-5382, or approved equal.
- C. Air Cushioned Swing Check Valve:** All air cushioned swing check valves shall be furnished with a lever and weight unless otherwise specified. The swing check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel seat ring, a non-corrosive shaft for attachment of weight and lever, complete non-corrosive cushion chamber, and shall allow removal of all internal parts without removing the valve body from the line.

The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The cushioning shall be by air, and the cushion chamber will be so arranged that the closing speed will be adjustable to meet the service requirements.

The valve disc shall be of cast iron or cast steel and shall be suspended from a non-corrosive shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.

The valve will be the Golden-Anderson Valve Specialty Company, Figure No. 250-D, Mueller A2606, or approved equal.

- D.** Hydraulically Operated Globe Check Valve: All hydraulically operated check valves shall be diaphragm-actuated, and hydraulically operated by line pressure. It shall be a spring-loaded, single seat globe type valve having a renewable seat ring. All necessary repairs other than replacement of the valve body shall be possible without removing the valve from the line. External packing glands or stuffing boxes are not permitted, and the diaphragm cannot be used as a seating surface. The disc shall be made of a resilient material.

The valve shall contain auxiliary controls which permit adjustment of the opening and closing speeds. The valve shall be Clayton 81C as manufactured by the Cla-Val Company, or #273D as manufactured by Golden-Anderson, or approved equal.

2.19 BUTTERFLY VALVES

All valves 16 inch and larger shall be butterfly valves and shall be manufactured in accordance with AWWA Standard C-504.

Valve shafts may be of one piece or two piece construction; however, in either case, the disc shall be of uniform thickness at the shaft axis. The steel shaft shall be of 18-8 stainless steel or 304 stainless steel. The valve shafts shall be designed as to provide permanent centering of the disc and shall have permanent self-lubricating shaft bushings.

The valve disc shall be manufactured of cast Ni-resist or a NSF approved corrosion-resistant material approved by the Engineer. The valve seat shall be of rubber and may be applied to the valve body or disc. In either case, the mating seat surface shall be 18-8 stainless steel, 304 stainless steel, or Ni-resist Type 1.

Unless otherwise stated on the Plans, and/or Bid Form, all butterfly valves shall be manufactured for a working pressure of 150 psi. All valves shall be tested to 300 psi by the manufacturer. The valve body shall be of cast iron with mechanical joint or flanged ends as indicated on the plans. All M.J. and flanged joints shall meet the applicable portions of Paragraphs 2.05 and 2.06 of these specifications.

All butterfly valves shall be designed for underground service. Valves to be used below ground shall be furnished with a 2 inch operating nut while valves to be used in above ground installations shall be furnished with a standard operating wheel.

Below ground valves shall be furnished with a suitable cast iron valve box complete with indicator and an indicator shall be attached to above ground installations.

The Contractor shall furnish the Owner with one (1) valve wrench to fit the operating nut furnished.

2.20 AIR RELEASE; AIR AND VACUUM; AND COMBINATION AIR AND VACUUM AND AIR RELEASE VALVES

- A.** General: All air release valves and combinations air and vacuum and air release valves shall be guaranteed not to blow shut under normal operating conditions with air flowing into the pipeline or being exhausted from the pipeline via the valve. Certifications may be requested of complete test results to substantiate the above requirements.

- B. Air Release Valves:** Air release valves shall be so designed to permit small quantities of air to escape automatically from pipelines under pressure. Air release valves shall be 1" NPT inlet unless otherwise specified and shall be Crispin Model PL10 or Golden-Anderson Figure 930-T, or approved equal.
- C. Air and Vacuum Valves:** Air and vacuum valves shall be so designed as to release a large quantity of air from an empty pipeline or water well during the filling process. The valve shall also permit air to enter the pipeline or water well. The valve size shall be as shown on the Plans, Specifications or Bid Form and shall be Crispin Series D or Golden-Anderson Figure 933, Val-Matic 102ST or approved equal.
- D. Combination Air Release and Air and Vacuum Valves:** Combination air and vacuum and air release valves shall include a small orifice valve for exhausting small quantities of entrained air and a large orifice valve for inducting as well as exhausting large quantities of air. The size of the required orifice shall be as specified on the plans.
- Combination valves shall be Golden Anderson's Figure 930-T, Dezurik Series 140 with mushroom cap, or approved equal.

2.21 VALVE BOXES

Valve boxes shall be cast iron of the two-piece screw type with an inside diameter not less than 5¼". The valve boxes shall be adjustable in length and the lid shall have the word "water" embossed on the top.

The box shall be installed flush with the ground or street surface and shall be supported by a 2' square concrete foundation as shown on the drawings. The box shall be suitable for the depth-of-bury of the valve on which it is installed. Contractor's compensation will not be based on length of the valve box.

The valve box shall be Mueller #H-10360, Clow #F-2454, or an approved equal.

2.22 FIRE HYDRANTS

- A. General:** Fire hydrants shall be UL-FM approved, cast iron bodied, fully bronze mounted, suitable for a working pressure of 250 psi and shall meet all requirements of AWWA C-502. Each hydrant shall be factory tested to 500 psi hydrostatic pressure. Fire hydrants shall have a 10 year standard warranty by the manufacturer, transferable to the Owner upon completion of the Contractor's warranty period. Fire hydrants shall be American Darling B-84-B, M&H Model 129, or approved equal.
- B. Connection and Nozzles:** Each hydrant shall have a 6-inch connection to street main, two 2-1/2 inch brass nozzles with threads for hose connections, and one 4-1/2 inch brass nozzle with threads for pumper coupling, together with caps fastened securely to each hydrant and threaded to fit nozzles. The threads for hose and pumper connections shall be those in use by the local firefighting department unless otherwise specified. Hydrants shall be opened by turning in a counter-clockwise direction and the direction of opening shall be cast on the head of the hydrants. The Contractor shall confirm the thread spacing with the applicable authority having fire-fighting responsibility in the area before ordering the hydrant. Furnish cap chains for each nozzle.
- C. Main Valve:** The bottom valve of the hydrant, unless otherwise specified, shall not be less than 5-1/4 inches in diameter. Friction loss shall not exceed 3.0 psi at 1,000 gpm through the 4 ½" pumper nozzle when tested in accordance with AWWA C502. The hydrant main valve shall be of the compression type, closing with pressure. The valve shall be faced with heavy impregnated waterproof balata or other approved equal material.

Drain valves shall be automatic and positive acting. When the main valve is closed, they shall automatically open insuring rapid and complete drainage of the hydrant riser. They shall close automatically when the main valve is opened. The hydrant shall be so constructed to permit withdrawal of internal working parts without disturbing the barrel or casing.

- D. **Color:** The color for fire hydrants shall be yellow.
- E. **Installation:** All hydrants shall have a safety breakable section located above the ground line. The hydrant shall be so constructed so that the main valve, when shut shall be tight when the upper portion of the barrel is broken off.

A standard depth hydrant shall be defined as a hydrant suitable for connection to water mains with 30 inches of cover from the top of the pipe to natural ground. All hydrants shall be standard depth unless otherwise specified on the plans, Bid Form, and/or Specifications.

Hydrants shall be accurately set in place such that the breakable flange shall be four (4) inches above finished grade or as recommended by the hydrant manufacturer. The recommended bury line shall be clearly marked on the hydrant barrel. Where standard depth hydrants are not suitable the Contractor shall furnish and install hydrant extensions to adjust the hydrant to the proper setting.

2.23 CASING PIPE

- A. **Corrugated Metal Pipe:** Corrugated metal pipe shall be conforming to AASHTO M 36 Type III and the requirements of LADOTD Specification 1007.03. The size and gage shall be as specified on the plans.
- B. **Welded Steel Pipe:** Steel casing pipe shall be in accordance with AWWA Specifications C 200, minimum grade B. The size and wall thickness shall be as specified on the plans. The interior and exterior of all casing pipe shall be cleaned, primed and lined with two coats of asphalt in accordance with AASHTO Designation: M 190, Type A. All steel casing shall be butt-welded and all welds shall be full penetration single butt-welds in accordance with AWWA Specification C206 and ANSI/AWS D10.7M/D10.7.

2.24 CONCRETE

Concrete shall be in accordance with 03 30 10 Concrete for General Construction.

2.25 COPPER CONDUCTOR

The Contractor shall furnish and install #10 AWG Type THHN insulated stranded copper wire where required to facilitate the use of electronic pipe locating equipment for locating non-electrically-conductive pipes, mains and service lines. Copper wire shall be installed with all non-conductive mains. Copper wire shall be installed with all non-conductive service lines located within highway rights-of-way. Wire splices shall be made using splice kits rated for direct burial under UL-486D and shall be 3M model DBR, King Innovation model King-6 DryConn, Spears Manufacturing model DS500 Dri-Splice, or approved equal.

Copper wire is not required to be installed with non-conductive service lines located on private property or private rights-of-way. No separate payment will be made for installation of copper conductor. The cost of copper conductor shall be included in the unit price per foot of pipe installed.

2.26 JOINT RESTRAINT

- A. **General:** The Contractor shall furnish and install joint restraint harnesses on all buried water piping 2" in diameter and larger as necessary to withstand the specified test pressure. All fittings, bends, tees, plugs, caps, etc. shall be restrained using an approved restraint device as shown on the plans. Pipe bell joints shall be restrained for the minimum lengths shown or as recommended by the restraint manufacturer, whichever length is greater. Unless otherwise specified in the plans or General Requirements, the Contractor shall use joint restraint harnesses in lieu of thrust blocks.
- B. **Joint Restraint for Fittings:** Joint restraint harnesses shall be specifically designed for the type of pipe used and shall be as recommended by the pipe manufacturer. Joint restraint harnesses shall utilize wedges or gripping rings to distribute the load uniformly around the circumference of the pipe. Harnesses employing wedges with radial actuating screws shall have breakaway bolt heads to limit the torque applied. Joint restraint

harnesses shall be capable of withstanding the full pressure rating of the pipe. Joint restraint harnesses shall be coated with fusion bonded epoxy and constructed of ductile iron and corrosion resistant materials. Bolts and nuts shall be stainless steel, or high strength, low-alloy steel manufactured in accordance with AWWA C111.

1. Mechanical Joints on Ductile Iron Pipe: Joint restraint harnesses for mechanical joint fittings on ductile iron pipe shall be Megalug Series 1100 as manufactured by EBAA Iron Works, Uniflange Series 1400 as manufactured by Ford Meter Box Company, or approved equal.
2. Push-On Joints on Ductile Iron Pipe: Joint restraint for push-on fittings on ductile iron pipe shall be "Fastite" with "Fast-Grip" gaskets as manufactured by American Cast Iron Pipe Company or "Tyton" joint with "Field Lok 350" gaskets by US Pipe & Foundry Company, or an approved equal.
3. Mechanical Joints on PVC Pipe: Joint restraint harnesses for mechanical joint fittings on PVC pipe shall be Megalug Series 2000PV or Megalug Series 15MJ00 as manufactured by EBAA Iron Works; Uniflange Series 1300 or Uniflange Series 1500 as manufactured by Ford Meter Box Company; or approved equal.
4. Push-On Joints on PVC Pipe: Joint restraint harnesses for push-on fittings on PVC pipe shall be Megalug Series 2500 as manufactured by EBAA Iron Works, Uniflange Series 1360, as manufactured by Ford Meter Box Company, or approved equal.
5. Mechanical Joints on HDPE Pipe: Mechanical joint connections to HDPE pipe shall use Harvey-type transition fittings as described in Paragraph 2.11.C.

C. Bell Joint Restraints:

1. Ductile Iron Pipe: Bell joint restraint shall be by use of gaskets and locking rings as described in Paragraph 2.05.B.2.
2. PVC Pipe: Bell joint restraint harnesses on PVC pipe shall be Megalug Series 1600 as manufactured by EBAA Iron Works, Uniflange Series 1390 as manufactured by Ford Meter Box Company, or approved equal.

D. Restrained Length: The Contractor shall provide joint restraints on all fittings and bell joints within a minimum distance of each restrained tee, bend, reducer, or cap. Unless otherwise approved by the Engineer, the minimum restrained lengths shall be as shown in the project details.

Minimum restrained lengths are dependent upon the test pressure, type of connection, type of pipe, type of backfill, and depth of bury. The Contractor may propose alternate restrained lengths for the specific installation conditions encountered in the project. Such proposals for alternate restrained lengths must be supported by data and calculations from the manufacturer and must be approved by the Engineer.

E. Installation: Joint restraint harness installation shall be in accordance with the manufacturer's instructions.

F. Thrust Blocks: Unless otherwise indicated on the plans or in the General Requirements, thrust blocks may only be used where specifically approved by the Engineer. Thrust blocks, where allowed, shall be constructed in accordance with Paragraph 3.18.

PART 3 – CONSTRUCTION METHODS

3.01 GENERAL

This part of the work includes installation of water mains, fittings, valves, valve boxes and appurtenances; excavation and backfill of trenches; cutting and replacing walks and roadway surfacing; and other miscellaneous items necessary to complete and make ready for operation a complete water distribution system.

3.02 COOPERATION WITH UTILITY OFFICIALS

The Contractor's attention is directed to the fact that his work will be performed in the close proximity of existing utilities, streets, drainage structures, etc. The Contractor shall at all times cooperate with the various utility and street officials and shall notify the appropriate personnel prior to excavation in areas where known utilities are located.

3.03 CLEARING OF RIGHT-OF-WAY

The Contractor shall clear the right-of-way provided for the main of all objectionable debris and obstructions that will interfere with the installation of the mains. Wooded areas shall be cleared and grubbed, and surface obstructions to remain shall be protected in accordance with Paragraph 3.06 of these specifications.

3.04 EXCAVATION OF TRENCH AND BACKFILL

Excavations, preparation of trenches, and backfill shall be in accordance with AWWA C600, except where amended by these Specifications. Excavation shall be such that the pipe will have no less than 30 inches of minimum cover (measured from top of trench to top of the barrel of the pipe). Trench bedding and standard backfill shall be as specified for each individual pipe material and detailed on the plan sheets.

A minimum horizontal separation of six feet shall be maintained between all water mains and services and any sewer mains. All water mains and services crossing sewer mains shall have a minimum vertical separation of 18 inches. All distances shall be measured from outside of pipe to outside of pipe.

3.05 OBSTRUCTION OF STREETS, PREMISES, ETC.

All material shall be placed so as to interfere as little as possible with public travel. At street crossings and other points as directed by the Engineer, trenches shall be bridged in a manner so as to prevent any serious interruption of public travel; the closure of both sides of a double roadway to vehicular traffic will not be permitted except by special permission. Special care must be taken to give free access at all times to all fire hydrants, water valves, fire alarm boxes and Police Department and Fire Department driveways.

In case the Contractor shall fail to keep open streets, sidewalks, approaches to premises, etc., and shall refuse or neglect to open them within twelve (12) hours after written notification by the Owner; or shall the Contractor fail to afford proper and necessary access to fire hydrants, water valves, fire alarm boxes or Police Department or Fire Department driveways, and shall neglect or refuse to afford such access within one (1) hour of receiving oral or written notice to do so, the Owner shall be and is hereby authorized and empowered to put on such force as may be necessary to do this work, deducting the actual cost thereof from any money which may be due or may become due the Contractor.

3.06 CONFLICT WITH SURFACE OBSTRUCTION

All shade trees, shrubbery, utility poles, etc., within the right-of-way provided shall be protected and any building or structure which may be endangered during the work shall be shored up and otherwise protected.

Any properties disturbed or damaged by the Contractor shall be restored to its original condition. No additional compensation will be made for this corrective work.

3.07 CONFLICT WITH SUBSURFACE OBSTRUCTIONS

The Contractor shall anticipate all underground obstructions such as waterlines, gas lines, sewer lines, utility lines, concrete and debris. Any such lines or obstructions indicated on the plans show only the approximate location and must be verified in the field by the Contractor. Neither the Owner nor the Engineer implies or guarantees the exact location of any existing underground utility; however, the Owner and Engineer will endeavor to familiarize the Contractor with all known underground obstructions.

The Contractor shall take the necessary precautions not to injure any gas or water pipe, sewer, drain or service pipes connected therewith or conduits or other underground structures, and the Contractor must repair or have repaired at once, at his own cost, any public or private structure or pipe damaged by or in the course of his work. Should the Contractor fail to repair or have repaired such damage or injury within a reasonable time, the Owner may after 24 hours written notice, have such repairs made and deduct the cost thereof from any amounts due or to become due the Contractor.

The Contractor shall assume all risks and be responsible for all expense and damage attending the presence or proximity of any gas or water pipes, sewers, drains, conduits, or other underground structures where such pipes or other structures cross the trench or appear in the trench in such a manner as not to demand their rearrangement or realignment. The Contractor's risks and responsibilities shall also apply to such structures as are approximately parallel with or adjacent to but outside of said trench.

The Contractor shall uncover known subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction.

Should any pipe or other obstruction (so located as to interfere with the work) be encountered, the Contractor shall at once notify the Engineer of the locality and circumstances and the place shall be passed over until satisfactory arrangements are made.

Should the obstruction parallel the trench, the Engineer may require the Contractor to offset or realign his pipeline to miss the obstruction. This realignment may be made by the use of fittings, pipe deflection and/or manholes as the case may dictate.

When the pipeline is offset to miss an obstruction no claim for damages or extra compensation shall accrue to the Contractor from the presence of such pipe or other obstruction or from any delay due to its presence. However, should there be a change in quantity of any established pay item due to this relocation, the Contractor shall be paid for these changes at the unit price bid.

Where subsurface obstructions cross the trench, the Contractor will be permitted to lay pipe above the obstruction if a minimum amount of cover can be maintained while providing a cushion between the bottom of the pipe and the top of the obstruction at least 6 inches thick. Where this minimum cover cannot be obtained, the Contractor will be required to lay the pipe under the obstruction and maintain a 6-inch cushion between the top of the pipe and the bottom of the obstruction. No additional payment will be made for additional depth or over depth mains required to miss an obstruction. Should the location or position of such obstruction within the limits of the trench be such, in the opinion of the Engineer, as to require removal, realignment or change of the obstruction in order that the work may proceed, such removal, realignment or change shall be without expense to the Contractor. When, however, such obstruction shall come within the limits of the excavation for the work as located by the Engineer, such pipe, conduit, or other obstruction shall be stripped or uncovered by the Contractor, at his own expense, as constituting a part of his work in excavating. No claim for damages or extra compensation shall accrue to the Contractor for any delay due to the presence and adjustment of the obstructions.

The Engineer will in all cases be the judge of the necessity or expediency of any change or rearrangement of any underground structures which may interfere with the construction of the work under this contract.

3.08 SPECIAL CROSSING - CANALS, RAILROADS, HIGHWAYS, ETC.

- A. **General:** Special crossings for which drawings have been made and on which a special price has been asked, whether a lump sum bid or otherwise, will be paid for according to the special specifications governing said crossings. Otherwise, no additional compensation will be paid for the construction of any utility line because of its crossing under or over any natural or man-made obstacle, provided the route of the waterline as bid has not been changed so as to produce a crossing not to be anticipated by the bidder.

- B. Permits:** Unless otherwise noted, the Owner will secure the necessary permit from the controlling agency for laying these lines. The Contractor shall comply with all provisions and requirements of the permit.
- C. Cooperation with Controlling Agency:** The Contractor shall submit to the Owner and the representative of the controlling agency, all details concerning the method of construction and materials to be used at least 10 days before beginning construction.

3.09 HANDLING AND DISPOSAL OF WATER

The Contractor shall pump, bail, or otherwise remove any water which may be found or may accumulate in the excavations, trenches, etc., and shall perform all work necessary to keep them clear of water while the work is in progress. The cost of removing water by pumping or otherwise shall be included in the prices bid for the various items of the work, unless a specific bid item is asked for such. The Contractor shall keep his completed work reasonably free of water and shall completely remove all of it for the purpose of installations, inspections, etc.

The Contractor shall prevent any of his work from obstructing any drainage ditch, canal, etc., unless special permission is obtained.

3.10 SHEETING AND BRACING

Wherever necessary for protection of workmen, for security of adjacent utilities or structures, for stability of trench, or for proper installation and operation of the water main the Contractor shall secure the trench to his satisfaction, to the extent of requiring close sheeting, or sheet piling and suitable bracing, including all nails, spikes and other fastenings.

Where the sheeting for a pipe is driven no lower than the top of the pipe, such sheeting may be withdrawn, provided that no sheeting is withdrawn until the trench has been refilled as hereinafter provided to a point not less than 2 feet above the crown of the pipe. Where it is necessary to drive sheeting below the top of the pipe, such sheeting shall be driven down to a point not less than 2 feet below the bottom of the pipe and properly braced. Bracing above the pipe shall be placed as to allow at least 1 foot clear space between the bottom of the bracing and the top of the pipe. Sheeting and bracing driven below the top of the pipe shall be cut off no lower than 2 feet above the top of the pipe before removing.

The Contractor will be paid by separate pay item for all sheeting and bracing left in place at the written direction of the Engineer. The cost of all sheeting and bracing not required to be left in place shall be included in the price bid for water main, and the Contractor will receive no additional compensation therefore.

3.11 LOCATION OF AND CONNECTION TO EXISTING WATER SYSTEM

- A. General:** The attention of the Contractor is directed to the fact that existing water mains or service lines will have to be temporarily removed from service, tapped, cut, abandoned, relocated, tied together and otherwise adjusted to completely perform all work required for this project.

These lines presently serve the residents of the area, and the Contractor will not be permitted to indiscriminately shut off service in these lines. The Contractor shall cooperate with the Owner in order that interruptions of service will be reduced to a minimum. The Contractor shall arrange with representatives of the Owner and the Engineer for a mutually acceptable time when service can be discontinued in the various sections of the system.

The general location, size and type of existing utilities have been taken from field observations or information provided by the utility owners.

The size of pipe indicated is the nominal diameter and the Contractor shall be responsible for obtaining the correct outside diameter of the pipe before ordering any valves, fittings or appurtenances to assure a proper fit.

- B. Location of Existing Utilities:** The approximate location of known existing utilities has been shown on the drawings. The final location of all tie-ins, taps and connections, shall be approved by the Engineer.

The Contractor shall be responsible for physically locating all existing pipe and appurtenances. No additional compensation shall be paid for such work, but shall be included in the various pay items established for such work.

- C. Tapping or Connecting to Existing Mains:** Where tapping sleeves and valves are called for on the plans the connection shall be effected without interrupting service of the existing mains.

Where plans call for "connect (size) to existing (size)" mains the Contractor may cut-in to the existing main. The Contractor shall prosecute the work in such a manner as to minimize the interruption of service to the Owner's customers.

These two items of work are separate and independent, with no duplication between them (i.e. installation of a tapping sleeve and valve does not qualify in addition as "connecting to existing main").

The Contractor shall notify the Owner and the Engineer at least 24 hours in advance and shall obtain prior approval before proceeding with the work.

- D. Connecting Existing Service Lines to Water Mains or Other Services:** Where indicated on the plans, the Contractor shall tie existing service lines, regardless of type, to the water main or service line as indicated.

This work shall include all necessary labor, field taps, adaptors, unions, dresser couplings, or other incidental devices required to connect the existing service line to the distribution main. Any gate valves or service pipe required to complete the installation shall be paid for separately

3.12 INSTALLING DUCTILE IRON PIPE

Ductile iron water pipe shall be installed in accordance with AWWA C600 (latest revision). Thrust restraint harnesses or thrust blocks shall be required at all bends, tees, and other fittings and at water hydrant installations.

The Standard Pipe Foundation detailed on the plan sheet shall be used for the installation of all ductile iron water mains, unless another type is specified on the plans.

Unless otherwise specified in the plans, General Requirements, or Bid Form and/or Plans, the Contractor shall encase all ductile iron mains in polyethylene encasement. The installation of all polyethylene encasement shall be in accordance with AWWA C105.

3.13 INSTALLING PLASTIC PIPE

All plastic water mains shall be installed in strict accordance with the manufacturer's recommendation and thrust restraint harnesses or thrust blocks shall be installed on all fittings 2 inches in size and larger.

Where plastic pipe lines are larger than two inches, valves and fittings will be anchored by tie rods and clamps to concrete anchors. See details on plans.

Solvent cement joints shall be made in accordance with ASTM D2855.

Solvent weld plastic pipe shall be snaked in the trench. Backfill shall not be placed on any plastic pipe while it is in a heated condition. Cooling of the pipe by some method approved by the Engineer will be required, if necessary.

Set time for newly assembled solvent weld joints shall be as follows:

30 Minutes minimum @ 60°F to 90°F

1 Hour minimum @ 40°F to 60°F

2 Hours minimum @ 25°F to 40°F

3.14 FIELD CUTTING OF PIPE

Field cutting of all pipe shall be accomplished by a method approved by the Engineer. Any section of pipe which is damaged during the cutting operation (including cement mortar lining) will be rejected.

3.15 SETTING OF VALVES AND FITTINGS

Setting of valves and fittings shall be in accordance with Section 10 of AWWA C600, except as modified for plastic pipe in Paragraph 3.14 of these Specifications.

3.16 SETTING OF FIRE HYDRANTS

Setting of fire hydrants shall be in accordance with Section 11 of AWWA C502 and the fire hydrant details shown on the plan sheets.

3.17 INSTALLING SERVICE ASSEMBLIES

The Contractor shall furnish and install service assemblies where shown on the plans or as directed by the Engineer. Service assemblies shall be installed according to the size and type designated on the plan sheets, and the Contractor shall furnish all necessary material, labor, and equipment to completely install the assembly according to this detail. Service pipe shall be a separate item and paid for as such. The Contractor shall not set the water meters until after all the mains have been hydrostatically tested and disinfected and approved by the Engineer and LDH.

3.18 THRUST BLOCKS, ANCHORING DEVICES, AND JOINT RESTRAINT

Unless otherwise specified on the plans or in the General Requirements or Bid Form, the Contractor shall restrain each fitting where thrust is generated (tees, bends, caps, reducers, valves, etc.) with joint restraint harnesses and shall restrain each joint and connection within a minimum specified distance of the restrained fitting as described in Paragraph 2.26. Thrust restraint harnesses and similar devices shall be installed in accordance with the instructions of the joint restraint harness manufacturer and any supplemental instructions by the pipe manufacturer.

Where indicated on the plans or in the General Requirements or Bid form or as directed by the Engineer, joints shall be restrained with concrete thrust blocks. The size of the thrust blocks shall be in accordance with details on the plan sheets. The sizes indicated were based on an undisturbed soil bearing pressure of 2,000 pounds per square foot. The Engineer shall be the sole judge as to the bearing pressure the soil encountered will be able to sustain. If in his judgment the soil allowable bearing pressure is other than the 2,000 pounds per square foot specified, the size of the thrust block shall be adjusted accordingly. No separate payment will be made for joint restraint harnesses or concrete thrust blocks. The cost of these shall be included in the price of other pay items.

The Contractor shall provide and remove any temporary thrust blocks or joint restraint harnesses needed to complete the testing of the system. No additional compensation will be made for such temporary thrust blocks but the cost of such shall be included in the various items for which a price has been established.

3.19 INSTALLING PIPE BY DRILLING OR BORING METHODS

When permitted by the specifications, certain street, highway, and/or railroad crossings by utility mains may be made either by jacking and boring or Horizontal Directional Drilling methods. The installation of utility pipe by either of these methods shall be in accordance with the requirements of the *Louisiana Standard Specifications for Roads and Bridges* regarding jacked or bored pipe.

The excavation of all approach pits and trenches within the right-of-way of the highway or railroad shall be of sufficient length from the street or railroad tracks to permit traffic to pass without interference. All backfill on the approach pits and trenches within the right-of-way shall be tamped in layers a maximum of 6 inches thick for the entire length and depth of the trench or pit. The backfill shall be compacted to 90% of maximum density obtained at optimum moisture as

determined by AASHTO T 180, Method A. Mechanical tampers may be used after a cover of 6 inches has been obtained over the top of the barrel of the pipe.

The boring operation shall be accomplished using a commercial type boring rig and the hole made by the installation shall be of the same diameter (within 2 inches) as the largest outside joint diameter of the pipe installed. The pipe shall be installed in the hole immediately after the bore has been made and in no instance shall the hole be left open while unattended.

In the event subsurface operations result in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor, at no additional cost to the Owner. In the event paving cracks on either side of the pipeline, or is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace same at his own expense without further compensation.

3.20 INSTALLING CASING PIPE

When specified on the plans, the Contractor shall furnish and install all utility mains parallel to and under railroad tracks and highways in a casing pipe. This casing shall be complete with end seals, vent pipe, and other specials required to install the main in the casing. All installations shall be in accordance with these Specifications and the requirements of the railroad or highway, as applicable.

Unless otherwise specified, the casing pipe shall be installed by boring or drilling methods in conformance with Paragraph 3.19.

3.21 FIELD HYDROSTATIC AND LEAKAGE TESTS

The hydrostatic testing of all lines shall conform to the requirements of AWWA C600, Section 5, except as modified below.

1. The maximum allowable leakage shall be 10 gallons per inch of pipe diameter per mile of pipe for 24 hours. The test pressure shall be 150 psi and shall be maintained for a minimum of 4 hours.
2. The test shall be applied to the whole or individual valved-off sections of the mains either before or after the trench is backfilled, as directed by the Engineer.
3. At the Contractor's option, services may or may not be included in the hydrostatic and leakage test. If the Contractor elects not to test the services, then all services will have a visual inspection after installation with full line pressure and the Contractor shall satisfy himself that there are no leaks. All services shall be flushed for a full 15 minutes.

The Engineer may require that he be present at any or all of these tests.

4. The Contractor shall furnish gauges, meters, water, tools, labor, equipment, and all other materials necessary to conduct the tests. The Engineer will be notified at least 48 hours in advance of the hydrostatic test.
5. The test pressure shall be 150 psi. The test pressure will be based upon the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge. Gauges shall have an operating range of twice the testing pressure and be glycerin-filled and liquid lubricated type.

Should the amount of leakage exceed that specified, the Contractor shall, at his expense, locate and repair the defective joints until the leakage is within the specified limits.

6. When the main being tested is a dedicated fire line serving a sprinkler system, the flushing and testing procedure shall be as identified in NFPA form "Contractor's Material and Test Certificate for Underground Piping". The test pressure shall be not less than 200 psi and shall be maintained for a minimum of 2 hours. The maximum allowable leakage shall be 2 quarts per hour per 100 joints regardless of pipe diameter. Allowable leakage adjustments identified on

the form will apply. The Contractor shall complete the form and submit it to the Office of the State Fire Marshall upon satisfactory completion of the testing.

3.22 WITNESSING OF TESTS

The cost of witnessing a test by the Engineer shall be borne by the Owner one time. The cost of witnessing re-tests of sections which fail the initial test will be deducted from Contractor payments for compensation of the Engineer.

3.23 DISINFECTION

All new water lines including appurtenances shall be disinfected in accordance with the Continuous Feed method of AWWA C651 following the acceptance of the hydrostatic test, except as noted herein.

Prior to disinfection, mains shall be filled to eliminate air pockets and shall be flushed with a minimum flushing velocity of 3 ft/s.

All new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than 10 ppm remains in the water after 24 hours standing in the pipe. A minimum application rate of 25 ppm chlorine solution is required.

While the disinfectant is being applied to any section of the system, the water will be allowed to escape at all extremities of this section until the presence of chlorine is evident by measurement with a DPD test kit furnished by the Contractor.

The Contractor may, subject to the approval of the Engineer, use the Tablet/Granule method or the Slug method as described in AWWA C651.

Once the water mains have been disinfected, flushed and are ready for bacteriological testing, the Contractor shall contact the Owner for collection of a sample. If bacteriological tests indicate insufficient disinfection at the completion of the test and flushing of the system, the procedure shall be repeated on that part of the system at no additional compensation. In no event will water from mains which have not been bacteriologically tested, or which have failed the test, be furnished for use as potable water until such mains have passed the test.

The Contractor shall take whatever steps necessary to prevent the backflow of the strong chlorine solution into any existing water distribution system.

3.24 LABORATORY TESTING

Each required water sample shall be analyzed by an independent State certified laboratory. All water samples shall be collected, preserved, and analyzed in accordance EPA-approved methods and with the latest edition of *Standard Methods for the Examination of Water and Wastewater*, published by the American Public Health Association. The laboratory shall be a State Certified Laboratory and shall be acceptable to the Louisiana Department of Health, Office of Public Health for each parameter tested or method used. Regularly updated lists of LDH/OPH State Certified Laboratories can be found on the Louisiana Department of Health website at:

www.ldh.la.gov

The Contractor shall maintain chain-of-custody for all samples and shall submit chain of custody documentation with all sample results. The sample volumes, types of sample containers, types of sample preservation, and required blank samples shall be as recommended by the laboratory. The Contractor shall obtain appropriate sample containers and chain-of-custody forms from the laboratory conducting the analysis.

All reports shall clearly identify the sample location. The Contractor shall provide complete reports on the Laboratory's standard format with the required QA/QC data. Sample results shall be provided to the Engineer promptly. Upon completion of all required analyses, the laboratory shall provide the testing results to:

1. The Engineer at his address of record.
2. The Contractor at his address of record.
3. The Owner at his address of record

3.25 INSTALLING LOCATOR WIRE OVER NON-CONDUCTIVE WATER PIPE

The Contractor shall install locator wire directly over and on the center of all non-conductive water mains. This wire shall be continuous on all non-conductive mains and shall be connected to all fixtures and appurtenances.

The Contractor shall install locator wire directly over and on the center of all non-conductive service pipe located on or tapped into water mains located on LADOTD or Parish rights-of-way.

For nonmetallic mains installed by trenchless methods, the locator wire shall be taped to the pipe with duct-type tape approximately every 10 feet. Tape length shall be sufficient to wrap a minimum of halfway around the pipe.

Installation of the wire shall be as detailed on the plan sheets. No special payment will be made for installation of locator wire. The cost of such shall be included in the unit price bid for water pipe.

3.26 SPECIAL BACKFILL

Certain areas requiring special backfill shall be as specified on the plans, Bid Form, and/or Specifications. The special backfill shall be of non-plastic granular backfill conforming to Unified Soil Class SW or SP with maximum aggregate size being 3/8 of an inch. The degree of compaction shall be as specified for the various pipe materials.

3.27 SPECIAL FOUNDATION (TYPE 2 STANDARD PIPE FOUNDATION)

Where indicated on the plans, Bid Form and/or Specifications, all pipe shall be supported by a special lumber foundation and gravel bedding detailed as Type 2 on the plans. The lumber shall be Southern yellow pine S.P.I.B. Grade No. 2, dimension rough, creosote coal-tar treated, with a minimum net retention of preservative of 16 pounds full cell per cubic foot of wood. The Contractor shall furnish a notarized manufacturer's certificate that the lumber meets specifications both in grade and treatment.

The gravel shall be clean, free from clay, sticks, or other deleterious substances, meeting the following gradation:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
3/4	100
5/8	95-100
No. 4	0-7

3.28 TRENCH BACKFILL AND COMPACTION

The pipe shall be supported and protected by tamping backfill in layers to the springline of the pipe. Stones encountered in the trench shall be removed for a depth of at least six inches below the bottom of the pipe.

- A. **Outside Street Surface and Shoulders:** The backfill in the trench above the pipe shall be placed in layers and compacted to prevent settlement of the trench. Prior to the final acceptance of the pipeline, the trench shall be level with the surrounding natural ground.
- B. **Inside Street Surfaces, Other Paved Areas and Street Shoulders:** The backfill in the trench above the pipe zone shall be placed in lifts not to exceed six inch compacted layers and compacted to the approximate density of the surrounding ground. The maximum density shall be determined in accordance with LADOTD Designation TR 418 and the in-place density determined by LADOTD Designation TR 401.

The trench shall be compacted for a depth of 2'- 0" above the top of the pipe using hand tamps or hand mechanical tamps before the use of a wheel type device or a hydro-hammer shall be used for compaction purposes.

The top 6 inches shall be compacted to 95% of standard density when measured by AASHTO - T99.

3.29 REPLACING STREET SURFACING AND SIDEWALKS

In all paved or unpaved streets, the surface of the trenches shall be finished without any needless delay and in the best workmanlike manner with the same kind of roadway or sidewalk improvement that was removed in excavating the trench.

Should the Contractor fail or refuse to repair any such damage, the Owner may after twenty-four (24) hours written notice, employ such personnel and furnish such materials as may be necessary and do the work, deducting the actual cost thereof from any amounts due or to become due to the Contractor.

The Contractor shall be obligated to maintain and keep in good condition any replacement of base, street surfacing or sidewalks from the time of installation until final acceptance of the work.

The replacement of all street surfaces shall be in accordance with the plan sheets and Section 03 30 10 Concrete for General Construction.

3.30 CLEANING UP, REMOVING SURPLUS EARTH, ETC.

The Contractor shall backfill each trench and excavation immediately after the work is installed. The Contractor shall then begin the initial cleanup, grading, shaping and removal of all surplus dirt except that actually necessary to provide for settlement of the filling. He shall also remove all pipe and other material placed or left on the street or right-of-way by him except material needed for the replacement of the paving. The street shall be opened and made passable for traffic.

The Contractor shall maintain all areas disturbed by construction until such time that all testing, pavement repairs and final restoration are completed. Testing, pavement repair and final restoration shall begin as promptly as possible or as otherwise required by the specifications.

Any surplus earth which may be left on the street or right-of-way after the excavations have been completely refilled shall be removed as soon as possible at his own expense except that in ungraded streets, it shall be optional with the Engineer whether surplus material shall be removed or deposited on the surface and graded for the convenience of traffic.

Final restoration and cleanup shall include grading and shaping ditches disturbed by construction and removing siltation from all drainage pipes and structures. Begin final restoration within 14 days of backfilling of each line segment.

Final acceptance will not be made until the Contractor has cleaned up the project to the satisfaction of the Engineer and Owner.

3.31 WARRANTY REPAIRS

Any defects repaired by the Contractor during the construction or warranty periods shall be performed in such a manner that the repaired work shall meet the specifications for original construction. The use of non-standard fittings such as full circle repair clamps shall not be allowed in lieu of standard cast or ductile iron fittings.

PART 4 – METHOD OF MEASUREMENT AND PAYMENT

- 4.01 WATER PIPE:** No separate measurement and payment will be made for water pipe. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.02 DUCTILE IRON PIPE FITTINGS:** No separate measurement and payment will be made for ductile iron pipe fittings. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.03 VALVES AND VALVE BOXES:** No separate measurement and payment will be made for valves and valve boxes. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.04 TAPPING SLEEVES AND TAPPING VALVES WITH BOXES:** No separate measurement and payment will be made for tapping sleeves and tapping valves with boxes. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.05 NEW FIRE HYDRANT ASSEMBLIES:** No separate measurement and payment will be made for new fire hydrant assemblies. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.06 FIRE HYDRANT EXTENSIONS:** No separate measurement and payment will be made for fire hydrant extensions. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.07 REMOVING AND SALVAGING FIRE HYDRANTS:** No separate measurement and payment will be made for removing and salvaging fire hydrants. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.08 INSTALLING SALVAGED HYDRANTS:** No separate measurement and payment will be made for installing salvaged hydrants. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.09 SPECIAL WATER STRUCTURES:** No separate measurement and payment will be made for special water structures. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.10 WATER SERVICE ASSEMBLIES:** No separate measurement and payment will be made for water service assemblies. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.11 WATER SERVICE ASSEMBLIES WITH REGULATOR:** No separate measurement and payment will be made for water service assemblies with regulator. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.12 WATER SERVICE PIPE:** No separate measurement and payment will be made for water service pipe. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.13 CASING PIPE- JACKING AND BORING METHOD:** No separate measurement and payment will be made for casing pipe – jacking and boring method. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.14 CASING PIPE- LAID IN OPEN CUT:** No separate measurement and payment will be made for casing pipe – laid in open cut. All materials and labor associated with this work shall be included in the price bid for associated items of work.

- 4.15 INSTALLING PIPE BY DRILLING OR BORING METHODS:** No separate measurement and payment will be made for installing pipe by drilling or boring methods. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.16 GRAVEL, STONE, CONCRETE OR OTHER PIPE FOUNDATION:** No separate measurement and payment will be made for gravel, stone, concrete, or other pipe foundation. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.17 SPECIAL FOUNDATIONS:** No separate measurement and payment will be made for special foundations. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.18 SPECIAL BACKFILL:** No separate measurement and payment will be made for special backfill. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.19 SHEETING AND BRACING LEFT IN PLACE:** No separate measurement and payment will be made for sheeting and bracing left in place. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.20 REMOVAL AND REPLACEMENT OF HIGHWAY, STREET, DRIVEWAY AND SIDEWALK PAVEMENT AND CURBS:** No separate measurement and payment will be made for removal and replacement of highway, street, driveway, and sidewalk pavement and curbs. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.21 CONCRETE SURFACES TO BE SAWED:** No separate measurement and payment will be made for concrete surfaces to be sawed. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.22 CLEARING AND GRUBBING:** No separate measurement and payment will be made for clearing and grubbing. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.23 REMOVAL AND REPLACEMENT OF CULVERT PIPES:** No separate measurement and payment will be made for removal and replacement of culvert pipes. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.24 CONNECTIONS TO EXISTING MAINS:** No separate measurement and payment will be made for connections to existing mains. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.25 CONNECTIONS OF EXISTING SERVICE LINES TO MAINS:** No separate measurement and payment will be made for connections of existing service lines to mains. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.26 INTERCONNECTING SERVICE LINES:** No separate measurement and payment will be made for interconnecting service lines. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.27 SPECIAL LUMP SUM- RAILROAD CROSSINGS, ROADWAY CROSSINGS, CANAL CROSSINGS AND LEVEE CROSSINGS, ETC.:** No separate measurement and payment will be made for special lump sum – railroad crossings, roadway crossings, canal crossings, and levee crossings, etc. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.28 VALVE ASSEMBLIES - AIR AND VACUUM AND AIR RELEASE VALVES, BLOW-OFF ASSEMBLIES, ETC.:** No separate measurement and payment will be made for valve assemblies – air and vacuum and air release valves, blow-off assemblies, etc. All materials and labor associated with this work shall be included in the price bid for associated items of work.

- 4.29 ITEMS TO BE FURNISHED TO THE OWNER:** No separate measurement and payment will be made for items to be furnished to the owner. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.30 TESTING AND DISINFECTION OF WATER MAINS:** No separate measurement and payment will be made for testing and disinfection of water mains. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.31 CLEANUP, MAINTENANCE AND FINAL RESTORATION:** No separate measurement and payment will be made for cleanup, maintenance and final restoration. All materials and labor associated with this work shall be included in the price bid for associated items of work.

END OF SECTION 02510

**SECTION 02535
SANITARY SEWER SYSTEM**

PART 1 - GENERAL

1.01 DESCRIPTION

This item shall consist of sewer trunk mains, lateral mains, service lines and force mains along with fittings, manholes, cleanouts, and other specified appurtenances, furnished and installed at such places as are designated on the contract drawings and profiles, or by the Engineer, in accordance with these specifications and in conformity with the lines and grades given.

The item shall include, in the bid prices per unit requested, the cost of common excavation and backfill, the cost of furnishing and installing all trench bracing and dewatering and the material for and the making of all joints.

1.02 LOCATION OF LINES

The approximate location of lines and manholes is indicated on the drawings as being within the bounds of street, highway or easement rights-of-way. The Engineer shall establish final location of the various items of construction in the field. Any location within said street, etc. may be used.

All costs not specifically listed as a pay item shall be included in the price bid for the item of which the costs are a part.

1.03 LAYOUT OF WORK

Layout of work will be as specified in the General Requirements of these specifications.

1.04 REFERENCE STANDARDS: References shall mean the latest revision of the following standards:

- A.** AASHTO M 6-----Standard Specification for Fine Aggregate for Hydraulic Cement Concrete
- B.** AASHTO M 190 -----Standard Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
- C.** AASHTO M 198 -----Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- D.** AASHTO T 99-01 -----Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
- E.** ANSI/ASME B16.1-----Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
- F.** ANSI/AWS D10.7M/D10.7 -----Guide for the Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe
- G.** ANSI/AWWA C104/A21.4-----Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
- H.** ANSI/AWWA C105/A21.5-----American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
- I.** ANSI/AWWA C110/A21.10 -----Ductile-Iron and Gray-Iron Fittings for Water
- J.** ANSI/AWWA C111/A21.11 -----Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- K.** ANSI/AWWA C115/A21.15-05-----Standard for Flanged Ductile-Iron Pipe with Threaded Flanges
- L.** ANSI/AWWA C150/A21.50 -----Thickness Design of Ductile-Iron Pipe

M.	ANSI/AWWA C151/A21.51 -----	American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
N.	ANSI/AWWA C153/A21.53 -----	Ductile-Iron Compact Fittings for Water Service
O.	ANSI/AWWA C200 -----	Steel Water Pipe - 6 in. (150 mm) and Larger
P.	ANSI/AWWA C206 -----	Field Welding of Steel Water Pipe
Q.	ANSI/AWWA C504 -----	Rubber-Sealed Butterfly Valves
R.	ANSI/AWWA C509 -----	Resilient-Seated Gate Valves for Water-Supply Service
S.	ANSI/AWWA C515 -----	Reduced-Wall, Resilient-Seated Gate Valves for Water-Supply Service
T.	ANSI/AWWA C600 -----	Installation of Ductile-Iron Water Mains and Their Appurtenances
U.	ANSI/AWWA C906 -----	AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,575 mm), for Water Distribution and Transmission
V.	ASTM A36 -----	Standard Specification for Carbon Structural Steel
W.	ASTM A473 -----	Standard Specification for Stainless Steel Forgings
X.	ASTM C150 -----	Standard Specification for Portland Cement
Y.	ASTM C32 -----	Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)
Z.	ASTM C33 -----	Standard Specification for Concrete Aggregates
AA.	ASTM C478 -----	Standard Specification for Precast Reinforced Concrete Manhole Sections
BB.	ASTM D1784 -----	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
CC.	ASTM D2241 -----	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
DD.	ASTM D2321 -----	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
EE.	ASTM D2412 - 02-----	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
FF.	ASTM D2412 - 02-----	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
GG.	ASTM D2487-----	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

HH.	ASTM D3034 -----	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
II.	ASTM D3139 - 98-----	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
JJ.	ASTM D3212 -----	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
KK.	ASTM D3261 -----	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
LL.	ASTM D3350 -----	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
MM.	ASTM D698 -----	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft ³ (600 kN-m/m ³))
NN.	ASTM F1417 -----	Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air
OO.	ASTM F477 -----	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
PP.	ASTM F679 -----	Standard Specification for Poly Vinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
QQ.	ASTM F714 -----	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
RR.	CISPI 301 -----	Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications
SS.	LADOTD TR 401 -----	The Determination of In-Place Density
TT.	LADOTD TR 418 -----	Moisture-Density Relationships
UU.	LADOTD Standard Specifications-----	Section 728 Jacked or Bored Pipe
VV.	UNI-B-6 -----	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.05 RELATED WORK

- A.** Section 03301----- Concrete for General Construction

PART 2 - MATERIALS

2.01 GENERAL

The pipe and other materials shall be of the type called for on the plans, in the Bid Form and/or in the General Requirements and shall be in accordance with the following appropriate requirements.

2.02 DIMENSION RATIO (DR)

Wherever in these specifications the term Dimension Ratio (DR) is used, it shall be understood to mean the ratio of diameter to wall thickness that is common for all pipe sizes of a particular dimension ratio series.

2.03 DUCTILE IRON PIPE, JOINTS, FITTINGS

- A. Ductile Iron Sewer Pipe:** Ductile iron sewer pipe for gravity sewers and sewage force mains shall conform in all respects to ANSI/AWWA C151/A21.51. The iron shall be fully annealed ductile iron, grade 60-42-10. The words ductile iron and the thickness class shall be conspicuously marked on each joint of pipe.

The pipe shall be of the thickness class fifty (50) or as otherwise specified in the General Requirements, Bid Form and/or plans for all joints except flanged. Flanged joint pipe shall be of the thickness Class 53.

The exterior of the pipe shall be standard coal tar coated as specified by ANSI/AWWA C151/A21.51.

The interior of ductile iron pipe shall be full thickness cement mortar lined at the factory in accordance with ANSI/AWWA C104/A21.4, unless a special lining is required by the General Requirements.

If required by the General Requirements, the pipe interior shall be lined with a resistant material, such as American Cast Iron Pipe Company, "Polybond" or U.S. Pipe Company "Protecto 401" liner, or approved equal.

- B. Joints:** The joints for ductile iron pipe and fittings shall be push-on or mechanical joint except where other joints are indicated on the plans and joints shall meet the following specifications:

1. Push-on and mechanical joints shall meet the requirements of ANSI/AWWA C111/A21.11 except as amended by ANSI/AWWA C115/A21.15.
2. Flanged joints shall meet the requirements of ANSI/AWWA C115/A21.15. Flanges shall be rated for a working pressure of 250 psi.
3. Restrained Joints: Restrained joints shall be "Fastite" with "Fast-Grip" gaskets as manufactured by American Cast Iron Pipe Company or "Tyton" joint with "Field Lok 350" gaskets by US Pipe & Foundry Company, or an approved equal.

Restrained joints that are subject to movement or vibration in service shall utilize a locking ring feature. Locking ring restrained joints shall be "Flex-Ring" as manufactured by American Cast Iron Pipe Company, "TR-Flex" as manufactured by US Pipe & Foundry Company, "Super-Lock" as manufactured by Clow Water Systems Company, or approved equal.

All means of joint restraint shall be as provided or as recommended by the pipe manufacturer and shall be installed in accordance with the manufacturer's written instructions.

4. Flexible Joints: Bolt-on type ball and socket flexible joints shall be as manufactured by American Cast Iron Pipe Company, US Pipe, or an approved equal. Bolts shall be stainless steel conforming to ASTM A296, Grade CA-15.

Boltless type ball and socket flexible joints shall be as manufactured by James B. Clow and Sons, Inc., American Cast Iron Pipe Company, or an approved equal. These joints shall provide a minimum of 15 degrees of deflection per joint.

- C. Fittings:** Fittings for ductile iron pipe shall be ductile iron fittings.

Ductile iron fittings for pipe shall be the compact type conforming to the requirements of ANSI/AWWA C153/A21.53 and shall be coal tar coated. All fittings shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4, except those for gravity sewer service, which shall be lined the same as the ductile iron pipe used for similar service. Flanged fittings shall conform to ANSI/AWWA C115/A21.15. Mechanical joint fittings shall conform to ANSI/AWWA C111/A21.11.

All ductile iron fittings shall be furnished in accordance with ANSI/AWWA C110/A21.10 with a rated working pressure of 350 psi for 3 inch to 24-inch diameter and 250 psi for 30 inch to 48-inch diameter.

- D. Bolts, Nuts, Etc.:** Bolts shall be as specified by the applicable ANSI specification for bolted joints or as recommended by the pipe manufacturer and subject to the approval of the Engineer. All bolts on flanged or mechanical joint pipe installed underground shall be made from a non-corrosive metal subject to the approval of the Engineer.

2.04 DUCTILE IRON RIVER CROSSING PIPE, JOINTS

When detailed on the plans, the Contractor shall furnish ductile iron pipe crossing rivers, drainage canals, creeks, etc. for sewage force mains.

- A. Pipe:** The pipe shall be of ductile iron and shall conform to Section 2.03A of these specifications.

The pipe shall be of the ball and socket type and shall have negative buoyancy when empty. The manufacturer shall submit data verifying that the pipe to be supplied has negative buoyancy; however, no pipe shall have a thickness less than Class 54.

- B. Joints:** The joints shall be of the ball and socket type and shall be either the bolt-on type or boltless type as specified below.

1. Bolt-on Type: The bolt-on type shall be furnished with stainless steel bolts conforming to ASTM A473, Grade CA-15. The pipe shall be as manufactured by American Cast Iron Pipe Company, James B. Clow & Sons, or an approved equal.
2. Boltless Type: The boltless type shall provide a 15° minimum deflection per joint and shall be as manufactured by U.S. Pipe Company, James B. Clow & Sons, Inc., or an approved equal.

2.05 DUCTILE IRON RESTRAINED JOINT PIPE

When detailed on the plans, the Contractor shall furnish ductile iron restrained joint pipe. Ductile iron restrained joint pipe shall meet the specifications for ductile iron in Section 2.03A of these specifications and the joint shall be the Flex-Ring as manufactured by American Cast Iron Pipe Company, or "Super-Lock" as manufactured by James B. Clow & Sons, or an approved equal. The minimum wall thickness shall be Class 52.

2.06 CAST IRON SOIL PIPE AND FITTINGS

Cast iron soil pipe and fittings may be used only on cleanouts, service connections and house stacks. Soil pipe shall meet CISPI 301.

2.07 P.V.C. PIPE, JOINTS, FITTINGS

- A. P.V.C. Non-Pressure Sewer Pipe:** All P.V.C. non-pressure sewer pipe shall be suitable for use as a gravity sewer conduit, and shall have a minimum pipe stiffness at 5 per cent deflection of 46 p.s.i. when tested in accordance with ASTM D2412. Pipe shall have an integral bell with a mechanical locked in gasket.

1. P.V.C. sewer pipe 4-inch diameter through 15-inch diameter shall meet the requirements of ASTM D3034, DR35.
2. P.V.C. sewer pipe 18-inch diameter through 27-inch diameter shall meet the requirements of ASTM F679. The pipe dimensions shall be as specified by ASTM F679 for the materials used.

- B. P.V.C. Pressure Sewer Pipe:** All P.V.C. pipe for sewage force mains shall conform in all respects to Product Standard PS 22-70, ASTM D2241, and shall meet the quality standard of the National Sanitation Foundation and bear its seal of approval. P.V.C. pipe shall be manufactured from a virgin polyvinyl chloride resin conforming to Type 1, Grade 1 resin of

ASTM D1784 (P.V.C. 1120). P.V.C. pipe shall have an integral bell with a mechanical locked in gasket.

Unless otherwise required by the plans, Bid Form, or General Requirements, P.V.C. pressure pipe shall have a maximum DR of 26. Where "special force mains" are detailed on the plans, 2-inch diameter and smaller pipe shall be furnished in 40-foot joint lengths.

All pipe shall have the manufacturer's trade name, the initials P.V.C., the pressure rating, and the N.S.F. seal of approval conspicuously marked on each length of pipe.

PVC Pressure Sewer pipe shall be pigmented green in color for positive identification as sewer piping. White pipe will be allowed, provided 3-inch width "Sewer" marking tape is installed directly above and within 6 inches of the pipe. When marking tape is used, it shall not take the place of the required locator wire. Blue pipe shall not be used for sewer applications.

C. Joints for P.V.C. Pipe: Unless otherwise permitted by these specifications or the plans, joints shall conform to the following.

1. P.V.C. Non-Pressure Sewer Pipe: Joints shall be integral wall bell and spigot. Each bell shall be supplied with a continuous rubber ring or gasket, which will be compressed radially to affect a positive watertight seal under all combinations of joint tolerance when assembled. Provision shall be made for expansion and contraction at each joint.

Any lubricant used in the installation shall be as recommended by the pipe manufacturer.

2. P.V.C. Pressure Sewer Pipe: Joints shall be "push-on"; plain end to bell type of joint shall conform to ASTM D3139. The bell shall be on an integral part of the pipe.

Each bell shall be supplied with a continuous, rubber ring which will properly seat in a groove or shoulder of the bell provided for it. The bell wall thickness at any point shall conform to the dimension ratio of the pipe except in the annular gasket space where the wall shall be at least the minimum wall thickness of the pipe. Designs not meeting this requirement shall be tested as specified by ASTM D3139.

Any lubricant used in the installation shall be as recommended by the pipe manufacturer.

D. Fittings and Accessories for P.V.C. Pipe: Unless otherwise permitted by these specifications or the plans, fittings shall conform to the following.

1. P.V.C. Non-Pressure Sewer Pipe: Fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and shall have bell and/or spigot configurations identical to that of the pipe. Fittings shall have a minimum pipe stiffness of 46 p.s.i. when tested in accordance with ASTM D2412.

(a) Fittings for diameters 4-inch through 15-inch shall conform to the requirements of ASTM D3034.

(b) Fittings for diameters 18-inch through 27-inch shall be made of P.V.C. plastic meeting the requirements of ASTM F679. Fittings shall be extruded and shall conform to ASTM D3212.

2. Fittings for P.V.C. Pressure Pipe: Fittings for 6-inch and larger P.V.C. pipe shall be ductile iron fittings conforming to Section 2.03C of these specifications. Fittings for 4-inch and smaller P.V.C. pipe shall be plastic fittings.

All plastic fittings furnished for polyvinyl chloride pipe shall be made from polyvinyl chloride conforming to the specifications listed in Section 2.07B. All fittings shall be compatible with the pipe upon which they are installed and only standard manufactured fittings will be accepted. The joints shall be in accordance with Section 2.07C.

2.08 POLYETHYLENE PRESSURE SEWER PIPE, JOINTS, FITTINGS

- A. P.E. Pressure Sewer Pipe:** All P.E. pressure sewer pipe furnished shall conform in all respects to ASTM F714 and ANSI/AWWA C906.

Polyethylene plastic pipe shall be manufactured from a virgin resin which has the primary physical properties which are identified by cell classification P.E. 345564C in accordance with ASTM D3350 and has been listed by the Plastic Pipe Institute (P.P.I.) as a P.E. 3408 designated compound.

All P.E. pipe shall be of a single manufacturer. All P.E. pipe shall be DR 11, Class 160, unless otherwise specified. The pipe shall be furnished in Ductile Iron Pipe Size.

All P.E. pipe shall have the manufacturer's name or trademark, the nominal pipe size, the PPI plastic pipe designation code and the Dimensional Ratio (DR) or wall thickness conspicuously marked at intervals of not more than 2 feet.

P.E. Pressure Sewer pipe shall be black with a green stripe or shall have a green exterior for positive identification as sewer piping. Solid black pipe will be allowed, provided 3-inch width "Sewer" marking tape is installed directly above and within 6 inches of the pipe. When marking tape is used, it shall not take the place of the required locator wire. Blue or blue-striped pipe shall not be used for sewer applications.

- B. Joints:** Pipe shall be joined into continuous lengths on the jobsite, aboveground using butt heat-fusion or electrofusion equipment and instructions provided by or recommended by the pipe manufacturer. Equipment shall be capable of meeting all temperature, pressure and alignment conditions recommended by the manufacturer. All fusion machine operators shall be certified by the pipe manufacturer.

Butt fusion joining shall be 100% efficient and shall produce a joint weld strength equal to or greater than the tensile strength of the pipe.

- C. Fittings:** Ductile iron fittings conforming to Section 2.03C shall be used for pipe sizes 6" and larger. Polyethylene thermal-fused fittings shall be used for pipe 4" and smaller. All polyethylene pipe fittings shall conform to ASTM D3261 and Section 2.08A of these specifications.

Transition fittings required at pipe material changes shall be the Harvey type mechanical joint adapter. Transition fittings shall be of the same DR as the pipe, shall exceed the tensile strength of the pipe and shall meet ANSI/AWWA C906.

2.09 PRECAST CONCRETE MANHOLES

Precast reinforced concrete manhole sections shall be manufactured in accordance with ASTM C478 to the dimensions required by the contract drawings.

Joints for precast sections shall be primed on the sealing faces with a product recommended by the manufacturer of the gasket. Primer shall be applied in accordance with the manufacturer's recommendations prior to delivery of the manhole sections to the job site. Joints shall be sealed with a flexible gasket material conforming to AASHTO M 198, Type B.

Manhole exterior sections including base sections, risers, cones, grade rings, tops, etc. shall receive a waterproofing admixture treatment. The concrete waterproofing admixture shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. Admixtures shall contain red dye to ensure detection in the concrete and must be added to the concrete at the time of batching and thoroughly blended into the concrete. The dosage rate for the waterproofing admixture shall be 20

lbs. per cubic yard of concrete or as recommended by the manufacturer. The Contractor shall include in his submittals, test reports in accordance with U.S. Army Corps of Engineers CRD C48 "Permeability of Concrete" in which all samples treated with the admixture showed no measurable leakage and water penetration of no more than 1.5 mm after 120 hours of being subjected to 150 psi water pressure. The Contractor shall also supply test reports in accordance with DIN 1048 for water impermeability of concrete in which no water permeates treated samples. The Contractor shall provide data showing that the admixture is capable of sealing cracks up to 0.40 mm in width and is suitable for a pH range of 3-11 with constant contact or 2-12 with periodic contact.

All joints, wall penetrations, lifting holes, etc. shall be grouted inside and outside with shrinkage compensating cement as specified herein.

Precast manhole units, coatings, gaskets, prime, grout, etc. shall be as approved by the Engineer prior to construction.

2.10 METAL CASTINGS

Metal castings for manhole frames, covers, and all other iron castings shall be of tough gray iron, free from injurious defects and of such quality that a blow from a hammer on a square edge will produce an indentation of the casting without flaking the metal. When broken, the faces shall show a fine grained, gray fracture. Manhole castings shall be Catalog No. V-1317 by East Jordan Iron Works, Neenah Foundry 1158-TO5, or approved equal. Adjustor rings shall be Catalog No. V-1941-2 by East Jordan Iron Works or approved equal. Bolted-down frames and covers shall be Catalog No. V-2480-1 by East Jordan Iron Works, or approved equal.

Castings shall be of the designs and dimensions indicated on the plans. All frames and covers shall be made accurately to the dimensions required and shall be machined to secure perfectly flat and true surfaces; allowance shall be made in the patterns to permit machining without sacrificing thickness. Covers shall fit the frames to any position.

Manhole rings and covers shall be of traffic grade and weigh not less than 250 pounds.

2.11 CEMENT

Cement for manhole construction, and other concrete meeting the requirements of Section 03 30 10 of these specifications shall conform to ASTM C150.

Cement used in the grout mixture used to seal pipe connections at manholes shall be shrinkage compensating cement similar to Texas Industries TXI4C, Chemically Prestressed Concrete Corporation of California, or equal.

2.12 SAND

Sand shall be sharp, clear, free from deleterious substances, and shall be uniformly graded. Fine aggregate for concrete shall meet the requirements of AASHTO M 6.

2.13 GRAVEL

Coarse aggregate used in concrete work shall meet the requirements of ASTM C33, one inch to No. 4 size.

2.14 WATER

Water used in concrete or mortar work shall be clear, free from oil, alkali, sugar, or other deleterious substances, and shall be potable.

2.15 CONCRETE

Concrete, reinforcing bars and wire mesh shall conform to Section 03 30 10 of these specifications, as applicable.

2.16 MISCELLANEOUS VALVES FOR SEWERS

When detailed on the plans, the Contractor shall furnish and install the various valves required. These valves shall meet the following specifications.

- A. Air Release and Air and Vacuum Valves:** All air release and air and vacuum valves shall be specially adapted for sewer service. The valve shall be designed to keep the valve operating mechanism free from contact with the sewage. Unless otherwise specified, the valve shall be furnished with a 2" inlet.

Air release valves shall contain provisions for back flushing. Shut-off and blow-off valves shall be permanent features of the design to permit routine back flushing by manipulation of these valves. A back flushing hose with quick disconnect couplings shall be furnished.

Air release valves shall be as manufactured by Dezurik Corporation and shall be the 450 SARV APCO Sewage Valve, or the Crispin Pressure Sewer Valve, as manufactured by Multiplex Corporation, or an approved equal.

Air and vacuum valves shall be as manufactured by Dezurik Corporation and shall be the 402 SAVV series APCO Sewage Valve, or a Crispin Air and Vacuum Sewer Valve, or an approved equal.

Sewer combination air valves shall be as manufactured by Dezurik Corporation and shall be the 445 SCAV series APCO Sewage Valve, or a Crispin combination Air Sewer Valve, or an approved equal.

Air valve installations may be of three types:

Type I	Air Release
Type II	Air and Vacuum
Type III	Combination Air Valve

The type(s) required shall be as listed in the bid schedule.

- B. Gate Valves:** All gate valves and tapping valves shall be manufactured in compliance with ANSI/AWWA C509 or ANSI/AWWA C515. Valves shall be the resilient seat type, shall have non-rising stems and shall be Mueller 2360 series, American Flow Control 2500 series, or an equal approved by the engineer.

All gate valves shall operate so that the valve will open when turning the operating nut in a counter-clockwise direction. All gate valves buried underground shall have a non-rising stem with operating nut and cast-iron valve box. All gate valves shall be designed for a minimum working pressure of 250 pounds per square inch and shall be capable of withstanding an internal hydrostatic pressure of 500 pounds per square inch. Buried gate valves shall have stems equipped with the standard (2" square) wrench nut. Gate valves installed aboveground shall be equipped with hand wheels. One valve wrench suitable to open and close all gate valves in this project shall be supplied to the Owner.

When the depth of bury is greater than 30 inches, the operating nut shall be brought to within thirty 30 inches of the ground surface by an appropriate extension of the stem.

- C. Butterfly Valves:** Butterfly valves shall be manufactured in accordance with ANSI/AWWA C504.

Valve shafts may be of one-piece or two-piece construction; however, in either case, the disc shall be of uniform thickness at the shaft axis. The steel shaft shall be of 18-8 stainless steel or 304 stainless steel. The valve shafts shall be designated as to provide permanent centering of the disc and shall have permanent self-lubricated shaft bushings.

The valve disc shall be manufactured of cast Ni-resist or other corrosion resistant material approved by the Engineer. The valve seat shall be of rubber and may be applied to the

valve body or disc. In either case, the mating seat surface shall be 18-8 stainless steel, 304 stainless steel, or Ni-resist Type I.

All butterfly valves shall be manufactured for a working pressure of 150 psi. Valve bodies shall be of cast iron with mechanical joint or flanged ends as indicated on the plans. All mechanical joints and flanged joints shall meet the requirements of ANSI/AWWA C111/A21.11 or ANSI/ASME B16.1.

All butterfly valves shall be designed for underground service. Valves to be used below ground shall be furnished with a 2-inch operating nut while valves to be used in above ground installations shall be furnished with a standard operating wheel. When the depth of bury is greater than 30 inches, the operating nut will be brought to within 30 inches of the ground surface by an appropriate extension of the stem. Below ground valves shall be furnished with a suitable cast iron valve box. The Contractor shall furnish the Owner with one valve wrench to fit the operating nut furnished.

- D. **Valve Boxes:** All valve boxes shall be made of cast iron and shall be of the heavy roadway type with an inside diameter of not less than 5 inches. The top section shall be adjustable for elevation and shall be of the two-piece screw type unless additional sections are needed due to deep cover of pipe. The base shall be sufficiently large so that it will not come in contact with the valve or pipe at any point.

The top of the valve box shall be installed flush with the ground surface or street surface and shall be supported by a 2' x 2' concrete foundation as shown on the drawings. The valve box cover or manhole cover shall be cast iron.

2.17 PIPE STOPPER, CLEANOUT CAPS, ETC.

- A. **Above Ground Cleanout Box:** All cleanouts shall be furnished with a cast iron cleanout box with "sewer" lettered on cover. The box shall be a Neenah Foundry R-1791-A, East Jordan Iron Works Catalog No. 1150, or approved equal.
- B. **Subsurface Line Plugs, Etc.:** All caps, plugs, etc. for D.I. sewer pipe or force main shall be D.I., mechanical joint or equal. All caps, plugs, etc. for PVC sewer pipe shall be plastic stoppers of standard manufacture.

2.18 CASING PIPE

Casing pipe shall be seamless steel in accordance with ANSI/AWWA C200. Materials shall conform to ASTM A36. The size and wall thickness shall be as specified on the plans. The interior and exterior of all casing pipe shall be cleaned, primed and lined with two coats of asphalt in accordance with AASHTO M 190, Type A. All steel casing shall be butt-welded and all welds shall be full penetration single butt-welds in accordance with ANSI/AWWA C206 and ANSI/AWS D10.7M/D10.7.

2.19 FOUNDATION, BEDDING, HAUNCHING AND BACKFILL MATERIALS

Requirements for various bedding and backfill classes shall be as detailed on the plans and the materials used shall be in accordance with the following specifications.

- A. **Coarse Aggregate:** Unless otherwise required by the pipe manufacturer, washed gravel shall be a No. 57 stone, shall be clean, free from clay, sticks, or other deleterious substances and shall meet the following gradation:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
1"	95-100
1/2"	25-60
No. 4	0-10
No. 8	0-5

- B. **Select Backfill:** Select backfill shall be Unified Soil Classification System Designation A-2-6 for normal excavations or A-2-4 for excavations beneath streets and driveways. Select backfill shall be clean, free from sticks or other deleterious substances.
- C. **Select Native Soil:** Select native soil shall be fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures (Unified Soil Classification soil types GM, GC, SM, and SC) or inorganic silts, very fine sands, silty or clayey fine sands, or inorganic clays of low to medium plasticity, silty clays, lean clays, having a liquid limit of 50% or less (Unified Soil Classification soil types ML, CL or CL-ML), as described in ASTM D2487.
- D. **Lumber:** Lumber shall be southern yellow pine S.P.I.B. Grade No. 2, dimension rough, creosote coal-tar treated, with a minimum net retention of preservation of 12 pounds full cell per cubic foot of wood. The Contractor shall furnish a notarized manufacturer's certificate that the lumber meets specifications in both grade and treatment.

2.20 PIPE FOR JACKING AND BORING

- A. **General:** Pipe for jacking and boring will be referred to as special force main pipe or special gravity sewer pipe. The material options will be as identified hereinafter or as modified in the General Requirements.
- B. **Installations under Louisiana State Highways:** Pipe shall meet the latest requirements of the Louisiana Department of Transportation and Development (LADOTD).
 - 1. **Pressure Sewers:** P.V.C. special force main pipe shall meet the manufacturing requirements described in Section 2.07; the outside diameter (O.D.) of the pipe bell or sleeve shall not exceed the O.D. of the pipe barrel by more than 1 inch. The maximum pipe DR shall be 21, in minimum lengths of 40 feet.
 - 2. **Non-Pressure Sewers:** P.V.C. special gravity sewer pipe shall meet the manufacturing requirements described in Section 2.07 for pressure or non-pressure sewers; the O.D. of the pipe bell or sleeve shall not exceed the O.D. of the pipe barrel by more than 1 inch.
- C. **Installations in Other Locations:** Pipe shall meet the requirements noted below:
 - 1. Pressure Sewers:
 - (a) P.V.C. pipe shall meet the requirements of Section 2.07, having a maximum pipe DR of 21 and minimum lengths of 40 feet.
 - (b) Ductile iron pipe shall meet the requirements of Section 2.03.
 - 2. Non-Pressure Sewers:
 - (a) P.V.C. pipe shall meet the manufacturing requirements described in Section 2.07 for pressure or non-pressure sewers.
 - (b) Ductile iron pipe shall meet the requirements of Section 2.03.

2.21 METALLIC WIRE

Metallic wire used as locator for any non-metallic or non-conductive (electric current) underground facility shall be #10 AWG Type THHN insulated stranded copper wire. Wire splices shall be made using splice kits similar or equal to model DBR by 3M. No separate payment will be made for furnishing and installing metallic wire. The cost of this work shall be included in the unit price per foot of pipe installed.

2.22 ELECTRONIC MARKER LOCATOR

Electronic marker locator furnished for signaling to a buried service connection marker shall be a single purpose instrument designed for such application; its signal frequency shall be compatible with the service connection marker furnished in accordance with Section 2.23.

The unit shall be the digital, microprocessor controlled type and shall be powered by replaceable alkaline C or D cell batteries. The unit shall be Fisher Model TW 7700 or an equal approved by the Engineer. It shall be furnished in a sturdy carrying case, which can be securely closed when not in use.

2.23 SERVICE CONNECTION MARKER

Service connection markers shall be sealed, waterproof, long life units designed for direct bury over underground utilities. The units shall be impervious to minerals, chemicals and temperature extremes, shall be simple to use, and unaffected by metal objects, conduit, fences or AC power. The units shall be compatible with the electronic marker locator furnished in accordance with Section 2.22. Connection markers shall contain no working parts, batteries, or other feature that would require maintenance.

2.24 FLEXIBLE MANHOLE COUPLINGS

Flexible couplings for connecting non-pressure sewer pipes through 27-inch diameter to manholes shall be made of tough elastomeric plastic, shall be resilient, and unaffected by soil conditions. Couplings shall be resistant to chemicals and normal sewer gases.

Stainless steel clamp bands shall be furnished for completing the assembly. Flexible couplings shall be similar to Fernco flexible couplings, or an equal, approved by the Engineer.

2.25 FLEXIBLE MANHOLE BOOTS

Flexible manhole boots for connection of non-pressure sewer pipes through 27" diameter to manholes or other structures shall be made of resilient neoprene elastomers. The boots shall be unaffected by soils conditions, resistant to chemicals and normal sewer gases. Stainless steel clamp bands and stainless-steel self-locking expansion bands shall be furnished for the complete assembly. The flexible manhole boots shall be similar to Kor N Seal Boots, as manufactured by National Pollution Control Systems, Inc.

2.26 ELASTOMERIC WATERSTOPS

Elastomeric plastic seals (gaskets) required on non-pressure sewer pipe connections to manholes shall meet the manufacturing requirements of ASTM F477, and shall be of the type designed for such application.

2.27 INSULATORS FOR PIPE IN CASING

Insulators for supporting pipe installed in casing shall be units designed for such use, constructed of steel, with steel capped plastic, or molded plastic insulating skids in sufficient number to support the carrier pipe when full of water. Insulators shall be DSI Series, as manufactured by PSI Products, Inc., or Model CI as manufactured by Advance Products and Systems, Inc., or approved equal. Appropriate risers and insulating runners shall be sufficient to prevent the carrier pipe bell from resting on the casing and sufficient to prevent flotation for gravity sewers. The spacing of the insulators shall be as indicated on the drawings.

2.28 TIMBER SHEETING

Materials for timber sheeting shall be rough-cut oak timbers with a minimum thickness of 2 inches, minimum width of 12 inches, and length as required. Timber walers and bracing shall be rough-cut oak of sufficient size and strength to adequately brace the sheeting.

2.29 BRICK

Manhole brick shall meet the requirements of ASTM C32. Cored brick is not permitted.

2.30 MANHOLE INSERTS

Where indicated on the plans, Bid Form, or General Requirements, new manholes shall be equipped with a manhole insert. Manhole inserts shall be equipped with a gas relief valve and shall have a water down leak rate of no greater than 5 gallons per 24-hour period. Inserts shall be

constructed of 18 Gauge 304 stainless steel and shall be equipped with a handle of 1" wide nylon webbing attached with stainless steel hardware. The seal between the insert and manhole casting shall be constructed of neoprene. Where specified, manhole inserts shall not be installed in the same manholes as manhole cover vent systems as described in Section 2.31.

2.31 MANHOLE COVER VENT SYSTEM

Where indicated on the plans, Bid Form, or General Requirements, new manholes shall be equipped with a cover vent system. Manhole cover vent systems shall be as manufactured by Sewer Sentry or approved equal. The vent system shall consist of two parts, including a device to penetrate the manhole lid to allow airflow in and out of the manhole as well as a rubber gasket for water tightness between the manhole frame and cover.

The venting device penetrating the manhole lid shall be dome-shaped and protruding approximately 5/8" above the manhole lid. The device shall be composed of a nylon resin material with an HS-20 vehicle loading rating that is resistant to chemicals, UV light and heat/cold. The device shall be equipped with a neoprene washer to effect a watertight seal with the manhole lid. The venting device shall be provided with an optional vent pipe extension of pultruded fiberglass tube 4' in length. The manhole ring gasket shall be EPDM rubber with a minimum 1,000 psi tensile strength resistant to ozone, oxidizing chemicals and acids as well as UV light. The gasket shall be secured in place with high-strength adhesive. Installation of all components shall be in strict accordance with the manufacturer's written instructions.

Where specified for new manholes, manhole cover vent systems shall not be measured and paid separately, but shall be included in the price of the manhole assembly.

2.32 JOINT RESTRAINT

- A. **General:** The Contractor shall furnish and install joint restraint harnesses on all buried pressure piping 2" in diameter and larger as necessary to withstand the specified test pressure. All fittings, bends, tees, plugs, caps, etc. shall be restrained using an approved restraint device as shown on the plans. Pipe bell joints shall be restrained for the minimum lengths shown or as recommended by the restraint manufacturer; whichever length is greater. Unless otherwise specified in the plans or General Requirements, the Contractor shall use joint restraint harnesses in lieu of thrust blocks.
- B. **Joint Restraint for Fittings:** Joint restraint harnesses shall be specifically designed for the type of pipe used and shall be as recommended by the pipe manufacturer. Joint restraint harnesses shall utilize wedges or gripping rings to distribute the load uniformly around the circumference of the pipe. Harnesses employing wedges with radial actuating screws shall have breakaway bolt heads to limit the torque applied. Joint restraint harnesses shall be capable of withstanding the full pressure rating of the pipe and shall be coated with fusion bonded epoxy and constructed of ductile iron and corrosion resistant materials. Bolts and nuts shall be stainless steel, or high strength, low-alloy steel manufactured in accordance with AWWA C111.
1. **Mechanical Joints on Ductile Iron Pipe:** Joint restraint harnesses for mechanical joint fittings on ductile iron pipe shall be Megalug Series 1100 as manufactured by Ebaa Iron Works, Uniflange Series 1400 as manufactured by Ford Meter Box Company, or approved equal.
 2. **Push-On Joints on Ductile Iron Pipe:** Joint restraint for push-on fittings on ductile iron pipe shall be "Fastite" with "Fast-Grip" gaskets as manufactured by American Cast Iron Pipe Company or "Tyton" joint with "Field Lok 350" gaskets by US Pipe & Foundry Company, or an approved equal.
 3. **Mechanical Joints on PVC Pipe:** Joint restraint harnesses for mechanical joint fittings on PVC pipe shall be Megalug Series 2000PV or Megalug Series 15MJ00 as

manufactured by Ebaa Iron Works, Uniflange Series 1300 or Uniflange Series 1500 as manufactured by Ford Meter Box Company, or approved equal.

4. Push-On Joints on PVC Pipe: Joint restraint harnesses for push-on fittings on PVC pipe shall be Megalug Series 2500 as manufactured by Ebaa Iron Works, Uniflange Series 1360, as manufactured by Ford Meter Box Company, or approved equal.
5. Mechanical Joints on HDPE Pipe: Mechanical joint connections to HDPE pipe shall use Harvey-type transition fittings as described in Paragraph 2.08.C.

C. Bell Joint Restraints:

1. Ductile Iron Pipe: Bell joint restraint shall be by use of gaskets and locking rings as described in Paragraph 2.31.B.2.
2. PVC Pipe: Bell joint restraint harnesses on PVC pipe shall be Megalug Series 1600 as manufactured by Ebaa Iron Works, Uniflange Series 1390 as manufactured by Ford Meter Box Company, or approved equal.

D. Restrained Length: The Contractor shall provide joint restraints on all fittings and bell joints within a minimum distance of each restrained tee, bend, reducer, or cap. Unless otherwise approved by the Engineer, the minimum restrained lengths shall be as shown in the project details. Minimum restrained lengths are dependent upon the test pressure, type of connection, type of pipe, type of backfill, and depth of bury.

E. Installation: Joint restraint harness installation shall be in accordance with the manufacturer's instructions.

PART 3 – CONSTRUCTION METHODS

3.01 GENERAL

This part of the work includes installation of sewer mains, manholes and other appurtenances; excavation and backfill of trenches; cutting and replacing walks and roadway surfacing; and other miscellaneous items necessary to complete and make ready for operation a complete sewerage system.

3.02 COOPERATION WITH UTILITY OFFICIALS

The Contractor's attention is directed to the fact that his work will be performed in the close proximity of existing utilities, streets, drainage structures, etc. The Contractor shall, at all times, cooperate with the various utility and street officials and shall notify the appropriate personnel prior to excavation in areas where known utilities are located.

3.03 CLEARING OF RIGHT-OF-WAY

The Contractor shall clear the right-of-way provided for the main of all objectionable debris and obstructions that will interfere with the installation of the mains. Wooded areas shall be cleared and grubbed and surface obstructions to remain shall be protected in accordance with Section 3.06 of these specifications.

3.04 EXCAVATION OF TRENCH AND BACKFILL

Excavations, preparation of trenches and backfill shall be in accordance with the applicable standards for the various types of pipe noted below, unless otherwise amended by these specifications or the contract drawings.

TRENCH AND BACKFILL PREPARATION STANDARDS

Type of Pipe	Standard
Ductile Iron	ANSI/AWWA C150/A21.50
Polyvinyl Chloride	ASTM D2321

It is the intent of these specifications that all pipe be properly supported, and then backfilled with select material meeting the requirements of Section 2.19 B or C. If the native soil in the trench is satisfactory for backfill (in any horizon), the Contractor shall preserve that material for use as backfill in the pipe zone. If the entire trench is in a soil which does not conform to the backfill requirements, Contractor shall furnish a borrow material which conforms to Section 2.19 B (Select Backfill) or Section 2.19A (Coarse Aggregate) for use in the pipe zone. The backfill type shall be approved by the Engineer. Compensation shall be as noted in the payment section.

A minimum horizontal separation of six feet shall be maintained between all water mains and services and any sewer mains. All water mains and services crossing sewer mains shall have a minimum vertical separation of 18 inches. All distances shall be measured from outside of pipe to outside of pipe.

3.05 OBSTRUCTION OF STREETS, PREMISES, ETC.

All material shall be placed so as to interfere as little as possible with public travel. At street crossings and other points as directed by the Engineer, trenches shall be bridged in a manner so as to prevent any serious interruption of public travel; the closure of both sides of a double roadway to vehicular traffic will not be permitted except by special permission.

Special care must be taken to give free access at all times to all fire hydrants, water valves, and Police Department and Fire Department driveways.

In case the Contractor shall fail to keep open streets, sidewalks, approaches to premises, etc., and shall refuse or neglect to open them within 12 hours after written notification by the Owner; or shall the Contractor fail to afford proper and necessary access to fire hydrants, water valves, Police Department or Fire Department driveways, and shall neglect or refuse to afford such access within 1 hour of receiving oral or written notice to do so, the Owner shall be and is hereby authorized and empowered to mobilize such force as may be necessary and to do this work, deducting the actual cost thereof from any money which may be due or may become due the Contractor.

3.06 CONFLICT WITH SURFACE OBSTRUCTION

All shade trees, shrubbery, utility poles, etc., within the right-of-way provided shall be protected and any building or structure which may be endangered during the work shall be shored up and otherwise protected.

Any properties disturbed or damaged by the Contractor shall be restored to its original condition. No additional compensation will be made for this corrective work.

3.07 CONFLICT WITH SUBSURFACE OBSTRUCTIONS

The Contractor shall anticipate all underground obstructions such as water lines, gas lines, sewer lines, utility lines, concrete and debris. Any such lines or obstructions indicated on the plans show only the approximate location and must be verified in the field by the Contractor. Neither the Owner nor the Engineer implies or guarantees the exact location of any existing underground utility; however, the Owner and Engineer will endeavor to familiarize the Contractor with all known underground obstructions.

The Contractor shall take the necessary precautions not to injure any gas or water pipe, sewer, drain or service pipes connected therewith or conduits or other underground structures, and the Contractor must repair or have repaired at once, at his own cost, any public or private structure or pipe damaged by or in the course of his work. Should the Contractor fail to repair or have repaired such damage or injury within a reasonable time, the Owner may after 24 hours written notice, have such repairs made and deduct the cost thereof from any amounts due or to become due the Contractor.

The Contractor shall assume all risks and be responsible for all expense and damage attending the presence or proximity of any gas or water pipes, sewers, drains, conduits, or other underground structures where such pipes or other structures cross the trench or appear in the trench in such a manner as not to demand their rearrangement or realignment. The Contractor's risks and

responsibilities shall also apply to such structures as are approximately parallel with or adjacent to but outside of said trench.

The Contractor shall uncover known subsurface obstructions in advance of construction when directed by the Engineer, so that the method of avoiding the obstruction may be determined before pipe laying reaches the obstruction. Should any pipe or other obstruction (so located as to interfere with the work) be encountered, the Contractor shall at once notify the Engineer of the locality and circumstances and the place shall be passed over until satisfactory arrangements are made.

Should the obstruction parallel the trench the Engineer may require the Contractor to offset or realign his pipeline to miss the obstruction. This realignment may be made by the use of fittings, pipe deflection and/or manholes as the case may dictate.

When the pipeline is offset, realigned, or changed in grade to miss an obstruction, no claim for damages or extra compensation shall accrue to the Contractor from the presence of such pipe or other obstruction or from any delay due to its presence.

However, should there be a change in quantity of any established pay item due to this relocation, the Contractor shall be paid for these changes at the unit price bid.

A. Conflicts Crossing Sewage Force Mains: Where subsurface obstructions cross the trench of a sewage force main, the Contractor will be permitted to lay the force main above the obstruction if a minimum amount of cover can be maintained while providing a cushion between the bottom of the pipe and the top of the obstruction at least 6 inches thick. Where this minimum cover cannot be obtained, the Contractor will be required to lay the pipe under the obstruction and maintain a 6-inch cushion between the top of the pipe and the bottom of the obstruction. Under special circumstances, the minimum cover, with the specific approval of the Engineer, may be reduced from 30 inches to twenty 24 inches.

Should the location or position of such obstruction within the limits of the trench be such, in the opinion of the Engineer, as to require removal, realignment or change of the obstruction in order that the work may proceed, such removal, realignment or change will be without expense to the Contractor.

When, however, such obstruction shall come within the limits of the excavation for the work as located by the Engineer, such pipe, conduit, or other obstruction shall be stripped or uncovered by the Contractor, at his own expense, as constituting a part of his work in excavating. No claim for damages or extra compensation shall accrue to the Contractor for any delay due to the presence and adjustment of the obstructions.

B. Conflicts Crossing Gravity Sewers: Where subsurface utilities or drains cross the trench of a gravity sewer and the sewer grade cannot be changed to miss the obstruction or the sewer cannot be realigned to miss the obstruction one of the following methods will be used at the direction of the Engineer.

1. Junction Boxes: The Contractor shall build a junction box over a drain and construct the sewer main through the junction box.
2. Utility Relocation: The Contractor shall relocate the utility in question to miss the sewer by lowering the utility or raising the utility.
3. Construct an Inverted Siphon: In cases where no other solution is available, the Contractor, at the specific direction of the Engineer, shall construct an inverted siphon under the utility or drain in question.

The Contractor shall be paid for these relocations and appurtenances as provided by the contract documents for such work or a change in contract price will be established for such work if not provided for.

The Engineer will in all cases by the judge of the necessity or expediency of any change or re-arrangement of any underground structures which may interfere with the construction of the work under this contract.

3.08 SPECIAL CROSSING - CANALS, RAILROADS, HIGHWAYS, ETC.

- A. **General:** Special crossings for which drawings have been made and on which a special price has been asked, whether a lump sum bid or otherwise, will be paid for according to the special specifications governing said crossings. Otherwise no additional compensation will be paid for the construction of any utility line because of its crossing under or over any natural or manmade obstacle provided the route of the sewer line as bid has not been changed so as to produce a crossing not to be anticipated by the bidder.
- B. **Permits:** Unless otherwise noted, the Owner will secure the necessary permits from the controlling agencies for laying these lines. The permits will be obtained in the name of the Owner; however, the Contractor shall be responsible for complying with all permit provisions.
- C. **Cooperation with Controlling Agency:** The Contractor shall submit to the Engineer and the representative of the controlling agency, all details concerning the method of construction and materials to be used at least 10 days before beginning construction.

3.09 HANDLING AND DISPOSAL OF WATER

The Contractor shall pump, bail, or otherwise remove any water, which may be found or may accumulate in the excavations, trenches, etc., and shall perform all work necessary to keep them clear of water while the work is in progress. The cost of removing water by pumping, bailing, etc. shall be included in the prices bid for the various items of the work. If a separate pay item is requested in the bid form, the cost of well pointing of sewage main trenches will be paid for separately. Otherwise, the cost shall be included in the amount bid for pipe installation. Separate payment will be made for well pointing only when such well pointing is authorized by the Engineer. The Contractor shall keep his completed work reasonably free of water and shall completely remove all of it for the purposes of installations, inspections, etc.

The Contractor shall prevent any of his work from obstructing any drainage ditch, canal, etc., unless special permission is obtained.

3.10 SHEETING AND BRACING

Wherever necessary for protection of workmen, for security of adjacent utilities or structures, for stability of trench, or for proper installation and operation of the sewer the Contractor shall secure the trench to his satisfaction, to the extent of requiring close sheeting, or sheet piling and suitable bracing, including all nails, spikes and other fastenings.

Where the sheeting for a pipe is driven no lower than the top of the pipe, such sheeting may be withdrawn, provided that no sheeting is withdrawn until the trench has been refilled as hereinafter provided to a point not less than 2 feet above the crown of the pipe. Where it is necessary to drive sheeting below the top of the pipe, such sheeting shall be driven down to a point not less than 2 feet below the bottom of the pipe and properly braced. Bracing above the pipe shall be placed as to allow at least 1 foot clear space between the bottom of the bracing and the top of the pipe. Sheeting and bracing driven below the top of the pipe shall be cut off no lower than 2 feet above the top of the pipe before removing.

The Contractor will be paid by separate pay item for all sheeting and bracing left in place at the written direction of the Engineer. The cost of all sheeting and bracing not required to be left in place shall be included in the price bid for sewer pipe of each size and depth, and the Contractor will receive no additional compensation therefore.

3.11 CUTTING INTO AND CONNECTING TO EXISTING SEWERS AND MANHOLES

When in the course of construction operations, it is necessary to cut into and/or connect to existing sewers and manholes at points indicated on the plans and in these specifications, the following provisions shall apply.

The flow in existing sewers shall not be interrupted without permission of the Engineer. If, in the opinion of the Engineer, any necessary interruption will be such as to prevent proper service to the public, the Engineer may require the Contractor to maintain pumps or other reasonable means of continuing or bypassing flow.

3.12 LOCATION OF EXISTING SEWERS AND MANHOLES

The approximate location of known existing sewers and manholes has been shown on the drawings and the final location of all tie-ins, taps, etc. shall be approved by the Engineer.

The Contractor shall be responsible for physically locating all existing sewer pipe and appurtenances to be connected to the new facilities. Compensation for such work shall be included in the pay items established for connections to existing manholes or sewers.

3.13 TEST PITS FOR LOCATION OF OTHER EXISTING UTILITIES

The approximate location of known existing utilities has been shown on the drawings. When ordered and at the location directed by the Engineer and before field layout of the construction, test pits shall be dug by the Contractor throughout the various streets or rights-of-way in which the work is to be constructed or in the immediate adjacent areas. The purpose of this investigative work is to verify the locations of existing underground utilities, which may conflict with the proposed work prior to construction. Upon discovery of a conflict, the Engineer may realign the proposed work, authorize the Contractor to relocate the existing utility or have the existing utility relocated by other means.

3.14 RELOCATION OF EXISTING UTILITIES

The proposed location and alignment of the work may cross or parallel existing utilities at various locations throughout the project site. It is intended to avoid relocation of existing utilities that conflict with the proposed work where possible by realignment or adjustment of the proposed work prior to installation. In the event of an unavoidable conflict with an existing utility, the Engineer may authorize the Contractor to relocate the utility.

The method of payment for any relocation work by the Contractor shall be as provided for in the bid schedule and described by the General Requirements to the contract documents.

3.15 INSTALLING ALL SEWERS

The installation of all sewer pipe shall be in stages; trench excavation, pipe bedding, and backfilling trenches. Generally, the installation shall be in accordance with the requirements of Section 3.04, unless modified herein.

A. "Pipe Zone" Requirements: The "Pipe Zone" for buried non-pressure sewers is shown on the plan sheets. The pipe zone widths shall comply with those detailed on the plan sheets unless the Engineer authorizes different widths for special situations. Unauthorized overwidths will not be considered when measuring theoretical volumes of pipe zone pay items. The terminology, as appropriate, shall also apply to pressure sewers. The requirements for non-pressure service pipe shall be as shown on the plan sheets, and described in Section 3.15B.

1. **Non-Pressure Sewers:** Unless otherwise required by the General Requirements, the "Standard Foundation" for all non-pressure sewers shall be as follows:

(a) **Invert Depths of 10 Feet or Less:**

1. **Bedding and Haunching:** Select native soil as defined in Section 2.19C, and obtained as described in Section 3.04, shall be utilized

for bedding and haunching. The trench bottom shall be prepared as required by the applicable ANSI or ASTM specification. Contractor shall ensure that adequate and continuous uniform support exists beneath the pipe at all points. Haunching material shall be densified or compacted as noted below (percent based on standard proctor, ASTM D698 or AASHTO T 99-01. Densify means thoroughly hand tamp in maximum 6-inch layers).

TABLE 3.15-1

Pipe Material	Required Compaction
P.V.C.	85-90%
Ductile Iron	75%

2. **Initial Backfill:** Select native soil as defined above shall be utilized from the pipe spring line to a height of 12 inches above the top of the pipe. Compaction or densification requirements shall be the same as required for haunching.

(b) Invert Depths of 10 Feet to 16 Feet:

1. **Bedding and Haunching:** Coarse aggregate as defined by Section 2.19A shall be required for PVC sewers for a bedding depth of the pipe outside diameter (O.D.) divided by 8 (O.D./8, 4" minimum) and for all of the haunching area. Except as provided below, bedding and haunching for ductile iron sewers shall be as described in Section 3.15A(1)(a).
2. **Initial Backfill:** Select native soil as defined by Section 2.19C, and obtained as described in Section 3.04, shall be utilized, compacted or densified as noted in Table 3.15-1.

(c) Invert Depths of 16 Feet to 24 Feet:

1. **Bedding and Haunching:** Bedding and haunching for P.V.C. sewers shall be coarse aggregate to the spring line of the pipe, installed as required by Section 3.15A(1)(b). Ductile iron sewers shall be bedded with coarse aggregate for a depth of OD/8 (4" minimum) and a haunching depth of OD/6; the remainder of the haunching area shall be select native soil placed as required by Table 3.15-1.
2. **Initial Backfill:** The initial backfill requirements shall be the same as described in Section 3.15A(1)(b)2.

(d) Invert Depths of 24 Feet to 30 Feet:

1. **Bedding and Haunching:** P.V.C. pipe shall be encased throughout the pipe zone in coarse aggregate. Ductile iron sewers shall be installed as required by Section 3.15A(1)(c).
2. **Initial Backfill:** Where applicable, initial backfill shall be installed as described in Section 3.15A(1)(b)2.

- (e) **Special Foundations:** If the trench soils and condition are such that the bottom is unstable, or migration of the pipe zone material can be anticipated, the Contractor shall, when specifically directed by the Engineer, install one of the "Special Foundations" detailed on the plan sheets in addition to the standard foundation. Compensation shall be as specified in the payment section.

1. Lumber Foundation: When authorized and directed by the Engineer, the Contractor shall install a lumber foundation as detailed on the plan sheets. The lumber foundation pay item shall include furnishing and installing the lumber foundation material only. The bedding, haunching and initial backfill areas of the pipe zone shall consist of coarse aggregate material in accordance with Section 2.19A.

Separate payment will be made for the coarse aggregate bedding and haunching material and the required initial backfill material only if it is not required as part of the standard foundation for the type and depth of the pipe.

2. Coarse Aggregate Foundation: When authorized and directed by the Engineer, the Contractor shall install a coarse aggregate foundation as detailed on the plan sheets. The coarse aggregate foundation shall consist of furnishing and installing coarse aggregate in accordance with Section 2.19A beneath the pipe zone. The depth of foundation below the pipe zone bedding shall be sufficient to properly support the pipe and prevent migration of fines into the pipe zone. The use of and depth of the coarse aggregate foundation shall be authorized by the Engineer. The bedding, haunching and initial backfill areas of the pipe zone shall consist of coarse aggregate material in accordance with Section 2.19A.

Separate payment will be made for coarse aggregate bedding and haunching material and the required initial backfill material only if it is not required as part of the standard foundation for the type and depth of pipe. The coarse aggregate foundation shall also apply to manholes.

- (f) Special Backfill: Special backfill in the pipe zone shall consist of coarse aggregate in accordance with Section 2.19A or select backfill in accordance with Section 2.19B and shall be used only when authorized by the Engineer. The special backfill may be authorized for the initial backfill or bedding and haunching in the pipe zone when the trench excavation material is unsuitable (in any horizon) to conform to the backfill requirements as specified in Section 3.04 or Section 3.15A(1). It is intended that the select backfill material be utilized as initial backfill in dry conditions when suitable native soils are not available in any horizon of the trench. Suitable native soils for initial backfill are defined in Section 2.19C and shall also have an acceptable moisture content to obtain the compaction requirements defined by Section 3.15A(1) for the depth and type of pipe.

2. Pressure Sewers: Unless otherwise required by the General Requirements, pressure sewers shall be installed as detailed on the plan sheets.

B. Sanitary Sewer Services:

1. Installation: Sanitary sewer services (generally diameters of 6 inch or less) shall be pipe meeting the requirements of Part 2. When the sewer main is 8 feet deep, or less, the service pipe shall be installed in accordance with Section 3.04 and Section 3.15A, for the applicable pipe material. When the sewer main pipe is at a depth greater than 8 feet, the installation shall be in accordance with the detail for "Type B" services shown on the plan sheets.
2. Location: Service line locations shown on the drawings are approximate.

The Contractor, through the Engineer's representative, shall coordinate the service location with the prospective sewer users so that the installed location will best accommodate the property to be served.

If a service is to be installed for a future connection (e.g. vacant lot), the installed location will be as directed by the Engineer. The ends of each service shall be plugged watertight, and marked using a service connection marker as described in Section 2.23, unless a service cleanout is required by the contract. The marker shall be installed strictly in accordance with the manufacturer's recommendations.

3. Grade and Elevation: Sanitary sewer services under this contract shall be installed by the Contractor at a minimum slope of 0.01 ft. per foot for 4-inch diameter services and 0.006 ft. per foot for 6-inch diameter services.

The Contractor shall install services to the elevation indicated on the contract drawings, if shown. If an elevation is not shown, the Contractor shall determine and install the service to the elevation required to enable the future service line to the sewer customer to have sufficient available grade. The available grade shall be sufficient to connect the existing or proposed facilities to the service tap, taking into account the location of the existing sewerage facilities, the elevation of the existing facilities, the length of the proposed route, minimum cover requirements of two (2) feet at any point along the proposed route, and minimum slope requirements for service lines of 0.01 ft. per foot for 4-inch diameter services and 0.006 ft. per foot for 6-inch diameter services. Should the Contractor discover that sufficient grade is not available, the Engineer shall be notified immediately.

C. Trench Requirements Above the Pipe Zone:

1. Outside Street Surfaces and Shoulders: The backfill in the trench above the pipe zone shall consist of the native material in the trench unless deemed unsuitable by the Engineer and shall be placed in layers and compacted to prevent settlement of the trench. Prior to the final acceptance of the pipeline, the trench shall be level with the surrounding natural ground.
2. Inside Street Surfaces, Other Paved Areas and Street Shoulders: The backfill in the trench above the pipe zone shall consist of the native material in the trench unless deemed unsuitable by the Engineer and shall be placed in lifts not to exceed twelve inch compacted layers and compacted to the approximate density of the surrounding ground.

The maximum density shall be determined in accordance with LADOTD TR 418 and the in-place density determined by LADOTD TR 401.

The trench shall be compacted for a depth of 2'-0" above the top of the pipe zone using hand tamps or hand operated mechanical tamps for compaction purposes.

The top six (6) inches shall be compacted to 95% of standard density when measured by AASHTO T 99-01.

Should the Engineer determine that the native material in the trench is not suitable for backfill above the pipe zone, the Engineer may authorize the use of a special backfill material. The special backfill material shall be a select backfill material conforming to Section 2.19B or a select material conforming to Section 2.19C but including only the semi-cohesive clayey gravels, sand-clay mixtures, and gravel clay mixtures, with a plasticity index of less than 15. The select material shall be placed in lifts not exceeding 12 inches and compacted by conventional methods to 95% of the standard density when measured by AASHTO T 99-01. The select backfill material shall be compacted by conventional methods as described above.

- D. **Metallic Wire:** A non-corrosive metallic wire shall be installed over the center and taped to non-metallic or non-conductive underground pressure sewers everywhere, and on non-pressure sewers within Louisiana DOTD highway rights-of-way. Metallic wire on pressure sewers shall be installed continuously and connected to all fixtures. Metallic wire installed on non-pressure sewer mains shall be continuous between manholes and connected to manhole rings at each manhole. Metallic wire over non-pressure sewer service pipes shall be spliced into the wire over the main. No separate payment will be made for this item. The cost shall be included in other items.

3.16 INSTALLING DUCTILE IRON NON-PRESSURE SEWER PIPE

Ductile iron non-pressure sewer pipe shall be installed in accordance with the requirements of Section 3.04 and Section 3.15.

Unless otherwise specified in the General Requirements, Bid Schedule and/or Plans, the Contractor shall encase the pipe in polyethylene material designed for such use. The installation of polyethylene encasement shall be in accordance with ANSI/AWWA C105.

3.17 INSTALLING DUCTILE IRON PRESSURE PIPE

Ductile iron pipe shall be installed in accordance with ANSI/AWWA C600. Joint restraints shall be required at all bends, tees, and other fittings. If directed by the Engineer, the Contractor may utilize concrete thrust blocks in lieu of restrained joints.

Unless otherwise specified in the General Requirements, Bid Form and/or Plans, the Contractor shall encase all ductile iron force mains in polyethylene encasement. The installation of all polyethylene encasement shall be in accordance with ANSI/AWWA C105.

3.18 INSTALLING PLASTIC PRESSURE PIPE

All P.V.C. and polyethylene sewage force mains shall be installed in strict accordance with the manufacturer's recommendations. Thrust restraint shall be required on all valves and fittings 2 inches in size and larger.

Polyethylene pipe shall be snaked in the trench. Backfill shall not be placed on any plastic pipe while it is in a heated condition.

The pipe foundation for pressure sewers shall be as detailed on the plan sheets and shall be used for the installation of all force mains, unless another type is specified on the plans.

3.19 MANHOLES, CLEANOUTS, ETC.

All essential details of construction of manholes, cleanouts, etc. are indicated on the plans; these drawings shall be followed carefully.

Manholes shall be constructed of precast reinforced concrete sections. Manholes shall be brought to grade with precast grade rings, half rings or manhole brick. If manhole brick is used, the inside and outside surfaces shall be plastered with 1/2-inch mortar. Joints shall be gasketed to form a watertight seal. The inside and outside of each joint shall be grouted as shown on the plans.

All manhole frames shall be properly set in mortar and shall finish flush with paving, at the proposed grades at these locations. Manholes outside of paved surfaces shall be set to within $\pm 1/2$ inch of proposed grade. When required by the drawings, bolted-down manhole frame and covers, as detailed on the plan sheets shall be installed. Where required by the drawings, Bid Form, or General Requirements, manhole cover vent systems shall be installed in accordance with Section 2.31 of this specification.

Unless otherwise called for on the drawings, or directed by the Engineer, the top elevation for manholes shall be 0.2 feet above the natural or proposed ground elevation at the manhole location. The top elevations of manholes in paved areas shall be flush with the pavement. Adjustments shall be made by the use of pre-cast concrete grade rings.

Inverts and bottom curves shall be built accurately and so formed as to facilitate the smooth entrance and flow of sewage through the manhole. Benches may be constructed of brick and of concrete, at the option of the Contractor. When brick is used, it shall be surfaced with a 1/2-inch thick layer of cement mortar composed of one part cement and two parts sand. Flow channels equivalent to the top of pipe shall be formed with concrete, then troweled to a smooth, even finish.

The manhole bottom from wall line to flow channels will be sloped approximately one inch per foot, and troweled smooth with a liberal radius applied at flow channel interceptors.

The technique of connecting sewers to manholes shall be as shown on the plans, or as approved by the Engineer. For those sewers which will not be extended immediately, the bell shall be securely closed with a watertight stopper of a type that can be readily removed without risk of damage to the bell.

Drop inlets shall be provided as detailed and where indicated on the plans.

3.20 HOUSE CONNECTIONS

The Contractor shall provide all labor, materials and equipment necessary for the construction of all service connections.

Service connections shall consist of wyes, tees, bends and service pipe either in 6-inch or 4-inch size at the locations shown on the plans or as designated by the Engineer. The type of fittings to be used and the size of fittings and service pipe shall be as designated by the Engineer. The opening of each branch shall be securely closed with a watertight stopper of a type that can be readily removed without risk of damage to the bell.

The standard service connection for sewers less than 8' feet deep shall be Type "A", and for sewers over 8' feet deep shall be Type "B", as shown on the plan sheets.

3.21 TRENCHLESS PIPE INSTALLATION

When permitted by the plans and specifications, certain right-of-way, street, highway, and/or railroad crossings by utility lines may be made by trenchless methods. The installation of gravity sewer, pressure sewer and casing pipe shall be by trenchless methods shall be in accordance with Louisiana Standard Specifications for Roads and Bridges - Section 728.

The excavation of all approach pits and trenches within the right-of-way of the highway or railroad shall be of sufficient length from the street or railroad tracks to permit traffic to pass without interference. All backfill on the approach pits and trenches within the right-of-way shall be tamped in layers a maximum of 6 inches thick for the entire length and depth of the trench or pit. The backfill shall be compacted to 90% of maximum density obtained at optimum moisture as determined by AASHTO T 99-01. Mechanical tampers may be used after a cover of 6 inches has been obtained over the top of the barrel of the pipe.

The boring operation shall be accomplished using a commercial type boring rig and the hole made by the installation shall be of the same diameter (within 2 inches) as the largest outside joint diameter of the pipe installed. The pipe shall be installed in the hole immediately after the bore has been made and in no instance shall the hole be left open while unattended.

In the event subsurface operations result in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor, at no additional cost to the Owner. In the event paving cracks on either side of the pipeline, or is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace it at his own expense without further compensation.

3.22 JOINT RESTRAINT ON PRESSURE SEWER PIPE

Unless otherwise specified on the plans or in the General Requirements or Bid Form, the Contractor shall restrain each fitting where thrust is generated (tees, bends, caps, reducers, valves, etc.) with joint restraint harnesses and shall restrain each joint and connection within a minimum specified distance of the restrained fitting as described in Paragraph 2.31. Thrust restraint harnesses and

similar devices shall be installed in accordance with the instructions of the joint restraint harness manufacturer and any supplemental instructions by the pipe manufacturer.

Where indicated on the plans or in the General Requirements or Bid form or as directed by the Engineer, joints shall be restrained with concrete thrust blocks. The size of the thrust blocks shall be in accordance with details on the plan sheets. The sizes indicated were based on an undisturbed soil bearing pressure of 2,000 pounds per square foot. The Engineer shall be the sole judge as to the bearing pressure the soil encountered will be able to sustain. If in his judgment the soil allowable bearing pressure is other than the 2,000 pounds per square foot specified, the size of the thrust block shall be adjusted accordingly.

No separate payment will be made for joint restraint harnesses or concrete thrust blocks. The cost of these shall be included in the price of other pay items.

The Contractor shall provide and remove any temporary thrust blocks or joint restraint harnesses needed to complete the testing of the system. No additional compensation will be made for such temporary thrust blocks but the cost of such shall be included in the various items for which a price has been established.

3.23 INSTALLING PIPE IN CASING

When specified on the plans, the Contractor shall furnish and install all utility mains under railroad tracks and highways in a casing. The casing shall be complete with end seals, vent pipe, and other specials required to install the main in the casing. All installations shall be in accordance with these specifications and the requirements of the railroad or highway, as applicable.

Casing pipe shall conform to the requirements of Section 2.18. Unless otherwise specified, the casing pipe shall be installed by the trenchless methods in conformance with Section 3.21.

All carrier pipe installed in casing shall be supported by 360° pipe insulators meeting the requirements of Section 2.27, spaced as called for on the plans.

3.24 ALIGNMENT TEST

Final alignment of the completed gravity sewer mains will be checked by the Engineer. The method of test shall include the use of mirrors and sunlight or artificial light. The alignment shall be confirmed by viewing the main between manholes or manhole locations. Failure to view a "full moon" shall mean rejection of the line under test. The cost of the alignment test shall be included in the separate pay item for testing gravity sewers. The cost of correcting defects and retesting shall be the responsibility of the Contractor at his expense.

3.25 FIELD HYDROSTATIC AND LEAKAGE TESTS FOR FORCE MAINS

The hydrostatic testing of all force mains shall conform to the requirements of ANSI/AWWA C600, Section 4, except as modified below.

- A.** The test shall be applied to the whole or individual valved off sections of the mains either before or after the trench is backfilled.
- B.** The Contractor shall furnish gauges, meters, water and all other material, tools, labor, and equipment necessary for conducting the tests. The Engineer will be notified at least 24 hours in advance of the hydrostatic test.
- C.** The test pressure shall be twice the normal working pressure of the sewage force main or 150 psi (whichever is greater) and shall be maintained for a minimum of 2 hours. The test pressure will be based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge.

Should the amount of leakage exceed that specified, the Contractor shall, at his expense, locate and repair the defects until the leakage is within the specified limits. The cost for testing shall be included in the separate pay item for leakage testing of force mains. The cost of correcting defects and retesting shall be the responsibility of the Contractor at his expense.

3.26 FIELD LEAKAGE TESTS FOR GRAVITY SEWERS

A. General:

1. At no point in the new portion of the gravity sewer shall the leakage of groundwater into the system exceed 200 gallons per day per inch diameter per mile of sewer main, unless another leakage allowance is specified in the General Requirements.

All sections of the sewer mains shall be tested and the cost of testing shall be included in the separate pay item for testing gravity sewers. Repairs on faulty work and additional tests shall be made by the Contractor at no additional cost to the Owner.
2. All tests shall be performed under the direction and to the satisfaction of the Engineer. The Contractor shall provide all labor, work, materials, equipment and facilities necessary to perform all tests. Only equipment approved by the Engineer shall be utilized in the said testing or preliminary line investigation, leak locating, etc.
3. All gravity-sanitary sewer lines, including but not limited to pipe, bends, fittings, specials, stubs, house connections, and appurtenances shall be tested for leakage throughout their entire length by lower pressure air testing as herein specified. This testing method is derived from ASTM F1417 and Uni-Bell UNI-B-6.
4. All sewer pipes being tested shall be entirely free from all debris, stones, sand and any other materials.
5. An accurate determination of the groundwater table shall be made at the time of testing. Groundwater elevation shall be determined by one of the following methods.
 - (a) A pipe probe shall be inserted by boring or jetting into the backfill material adjacent to the center of the pipe, at distances not exceeding 500 feet. Prior to testing, the water level shall be determined after blowing air through the pipe.
 - (b) Manholes at distances of approximately 500 feet apart shall be provided with one-half inch diameter nipple. The nipple shall be threaded inside and extend on each side of the manhole wall by 2 inches. The nipple shall be of non-corrosive material and provided with watertight cap. It shall be installed at a height as directed by the Engineer.

Prior to testing, the water level shall be determined by removing the cap, blowing air through the pipe and connecting clear plastic tube to the pipe nipple. The plastic tube shall be held vertically to allow groundwater to rise in it.

B. Air Testing: Gravity sewer pipe shall be tested by the air test technique between every two consecutive manholes.

1. The test section shall be plugged at each end with one of the plugs tapped and equipped for an air inlet connection for filling the line from an air compressor. The air control equipment shall include the pressure gauge having a pressure range from 0 to 5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of ± 0.04 psi.
2. The air shall be supplied to the test section slowly, until the internal pressure is raised to approximately 4.0 psi, after which the pressure will be allowed to stabilize for not less than 5 minutes. When the pressure has stabilized, and is at or above a starting pressure of 3.5 psi, the test shall begin.
 - (a) The water table elevation shall be determined as stipulated in Section 3.26(A).

- (b) If the pipe to be tested is submerged in groundwater, the backpressure due to groundwater submergence over the end of the probe shall be added to all gauge pressures in the test.
3. The test time shall be determined from the following table. Calculated test times shall take into account the length of all pipe of various diameters within the test section.

MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

Nominal Pipe Size (Inches)	Minimum Test Time (min:sec)	Length for Minimum Time (ft)	Time for Longer Length (sec)
4	3:46	597	0.380 * L
6	5:40	398	0.854 * L
8	7:34	298	1.520 * L
10	9:26	239	2.374 * L
12	11:20	199	3.418 * L
15	14:10	159	5.342 * L
18	17:00	133	7.692 * L
21	19:50	114	10.470 * L
24	22:40	99	13.674 * L
27	25:30	88	17.306 * L
30	28:20	80	21.366 * L
33	31:10	72	25.852 * L
36	34:00	66	30.768 * L
42	39:48	57	41.883 * L

Note: If the tested segment is longer than the length for minimum time, determine the test time by multiplying the length of the segment by the factor in the fourth column. (Ex. – For a 300-foot segment of 12" diameter pipe, the required test time is 300 ft. * 3.418 = 1025.4 sec = 17:05, min:sec)

4. The total pressure drop during the testing period shall be recorded.
- (a) If the pressure drops more than 1.0 psi during the test time, the line segment shall have failed the test.
- (b) If the pressure drops 1.0 psi or less during the test time, the line segment shall have passed the test.
- (c) If the testing time for a line segment is longer than one hour and the segment shows zero pressure drop (0.0 psi) during the first hour of testing, the testing may be stopped and the line segment shall have passed the test. If the line segment has any pressure drop during the first hour, the test shall be continued for the duration of the testing period.

3.27 DEFLECTION TEST FOR FLEXIBLE PIPE

Deflection tests shall be performed on all flexible pipes unless otherwise specified in the General Requirements. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of 5% unless otherwise specified in the General Requirements. The deflection test is to be run using a rigid ball or mandrel and shall have a

diameter equal to 95% of the inside diameter of the pipe unless otherwise specified. The test shall be performed without the use of mechanical pulling devices.

The cost of the deflection test shall be included in the separate pay item for testing gravity sewers. The cost of correcting defects and retesting shall be the responsibility of the Contractor.

3.28 LEAKAGE TEST FOR MANHOLES

All manholes shall be tested for leakage by visual inspection. Any noted defects shall be corrected by the Contractor at his expense. Retests by the Contractor shall be at the expense of the Contractor.

A visual inspection by the Engineer will be required for all precast concrete manholes. The manholes shall have no visible leaks at the time of inspection, during the contract period, or during the warranty period. All visible leaks which appear shall be repaired. No separate payment will be made for this test inspection.

3.29 WITNESSING OF TESTS

The cost of witnessing a test by the Engineer shall be borne by the Owner one time. The cost of witnessing re-tests of sections which fail the initial test will be deducted from Contractor payments for compensation of the Engineer.

The Engineer will witness all tests, and shall be given at least 24 hours prior notice of a test.

3.30 INTERNAL INSPECTION

The Owner may have the completed gravity sewer line inspected using television or still camera equipment. In the event such inspection is utilized, the actual cost therefore shall be paid by Owner. Beyond normal, routine coordination and cooperation, the Contractor shall not have any responsibility for furnishing assistance.

Problem areas or construction deficiencies identified by internal inspection shall be repaired or corrected by Contractor at no additional cost to Owner.

The time required for performing the internal inspection shall not be considered a part of the contract time unless performed simultaneously with other Contractor activities. If internal inspection is performed, a contract time extension may be authorized by Owner without penalty to Contractor; Contractor shall not be entitled to extra compensation.

3.31 REPLACING STREET SURFACING AND SIDEWALKS

In all paved or unimproved streets, the surface of the trenches shall be finished without any needless delay and in the best workmanlike manner with the same kind of roadway or sidewalk improvement that was removed in excavating the trench.

Should the Contractor fail or refuse to repair any such damage, the Owner may, after 24 hours written notice, employ such personnel and furnish such materials as may be necessary and do the work, deducting the actual cost thereof from any amounts due or to become due to the Contractor.

The Contractor shall be obligated to maintain and keep in good condition any replacement of base, street surfacing or sidewalks from the time of installation until final acceptance of the work.

The replacement of all street surfaces shall be in accordance with the details shown on the plan sheets.

3.32 CLEANUP, MAINTENANCE AND FINAL RESTORATION

As soon as the backfilling of any excavation is completed, the Contractor must at once begin the initial cleanup, grading, shaping, and removal of all surplus dirt, except that actually necessary to provide for settlement, and removal of debris left as a result of construction. All streets and driveways shall be made passable for traffic.

The Contractor shall maintain all areas disturbed by construction until such time that all testing, pavement repairs and final restoration are completed. Testing, pavement repair and final restoration shall begin as promptly as possible or as otherwise required by the General Requirements.

Unless otherwise required by the General Requirements, any surplus earth which may be left on the street or right-of-way at the time final clean up and restoration are started shall be regarded as the property of the Contractor and must be removed at his expense. On ungraded streets, it shall be optional with the Engineer whether surplus material shall be removed or deposited on the surface and graded for the convenience of traffic.

Final restoration and cleanup shall include grading and shaping ditches disturbed by construction and removing siltation from all drainage pipes and structures.

Final acceptance will not be made until the Contractor has cleaned up the project to the satisfaction of the Engineer and the Owner.

3.33 REMOVAL AND REPLACEMENT OF DRIVEWAY CULVERT PIPE

This item of work is intended for driveway culverts of all sizes and types which require removal to facilitate construction of the contract work. When approved by the Engineer, the Contractor shall remove and replace driveway culverts as required to facilitate construction.

Surface material at gravel or shell drives shall be removed and stockpiled separately from the trench excavation material for reuse in restoring the driveway. Hard surfaced driveways shall be removed and replaced in accordance with these specifications and the details shown on the drawings. The culverts shall be carefully removed and stockpiled by the Contractor. Care shall be taken to minimize damage to the culvert during the removal, stockpiling, and reinstallation. Any damage to the culvert caused by the Contractor's negligence will be the Contractor's responsibility. After the installation of the sewer main and/or appurtenance, the driveway culvert shall be replaced on grade. All trench backfill and culvert backfill shall be compacted as required by Section 3.15C(2). At gravel or shell drives, the stockpiled surface material shall be replaced by the Contractor to restore the driveway surface. Additional surface material may be authorized to complete the reinstallation.

It is intended that existing driveway culvert materials be reused when culverts are removed and replaced. Should the existing culvert materials be unsuitable for reuse as determined by the Engineer, the Contractor may be authorized to purchase suitable replacement materials for installation.

The existing salvageable materials not reused shall remain the property of the Owner and shall be delivered to a site to be designated and stockpiled in a neat and orderly arrangement. Unsalvageable materials shall be disposed of by the Contractor. The size, type, and length of the replacement materials will be designated by the Engineer.

3.34 REMOVAL AND REPLACEMENT OF FENCES

This item of work is intended for all types and sizes of fences such as wood, wire, stone, etc. which require removal to facilitate the construction of the contract work.

The number of panels or length of fence to be removed and replaced shall be as shown on the contract drawings or designated by the Engineer. The section of fence to be removed shall be carefully dismantled, and stored.

The Contractor shall construct a temporary fence when required to contain animals, livestock, etc. until the permanent fence is replaced. The cost of temporary fences, including materials, shall be the Contractor's responsibility.

Upon completion of the installation of the sewer main and/or appurtenances, the fence shall be replaced in good condition. Should the existing fence material be unsuitable for reuse, the Engineer

may authorize the purchase of replacement material. The Contractor shall supply a material list to the Engineer of the required fencing materials for approval prior to the purchase.

3.35 STRUCTURAL CONCRETE FOR THE REPLACEMENT OF CONCRETE STRUCTURES

The Contractor shall remove and replace existing concrete structures which conflict with the proposed sewerage facilities as indicated by the contract drawings or as authorized by the Engineer. This item shall include miscellaneous structures such as headwalls, catch basins, retaining walls, concrete boxes, footings, concrete ditches, light standards, etc. This item does not include items covered elsewhere in the contract documents such as pavement repair, fences, standard pipe foundations, thrust blocks, etc.

The concrete materials and construction methods shall be in accordance with Section 03 30 10 of these specifications unless otherwise specified in the General Requirements to the contract documents. The replacement structure shall conform to the dimensions of the existing structure unless otherwise approved by the Engineer. Steel reinforcement shall be required as necessary to replace the structure in kind, or as otherwise required by the Engineer or contract drawings.

The Contractor shall be responsible for disposal of the debris resulting from the replacement including the existing structure.

PART 4 – METHOD OF MEASUREMENT AND PAYMENT

4.01 NON-PRESSURE SEWER PIPE

Non-pressure sewer pipe will be paid for by the lineal foot according to size and depth, as follows: 0-6 feet deep, then in two-foot increments to deepest known depth, such as 6-8 feet, 8-10 feet, etc., except as specified otherwise in the bid schedule. This includes payment for non-pressure sewer pipe installed by trenchless methods.

A. Measurement: Measurement for lengths of the various types of non-pressure sewers installed shall be as follows:

1. **Normal Excavation:** Measurement for the lengths of sewers will be horizontally from center to center of manholes and from the center of manhole to end of pipe without deduction for fittings or manholes. The average depth will ordinarily be calculated from elevations taken approximately 50 feet apart on the ground surface or pavement before it is disturbed and from the elevations of invert of the sewer directly below.

If either the ground surface or the elevation of the sewer is very irregular (as in the case of crossing under embankment), the elevations will be taken at extreme points and closer together as may be necessary to determine the depth with sufficient accuracy.

The average depth of sewer crossing under a waterway or an open canal will be calculated below a straight line joining the natural (not super-elevated) surface on both banks; the average depth under a closed canal or a track will be calculated below the actual ground surface. A normally dry excavation or depression not in use as a canal or waterway will not be regarded as a canal; the actual ground surface will be used in calculating the depth of the sewer.

2. **Jacking and Boring:** Measurement for the length of non-pressure sewers installed by jacking and boring shall be: (1) from toe of fore slope to toe of fore slope for street and highway crossings which have open ditch drainage; (2) from the toe of fore slope to toe of fore slope of the embankment for railroad crossings; (3) from the back of curb to back of curb for street and highway crossings with curb and gutter construction; (4) for the length shown on the plans for any other jack and bore installations.

The Contractor may elect to exceed the limits described above for his convenience in order to avoid inconveniences associated with existing utilities or other reasons, however, measurement will be as described above and additional lengths of special gravity sewer pipe and jack and bore installation for the Contractor's convenience will be at his expense.

The jack and bored pipe will be measured for depth by averaging the depths of the two ends of the crossing.

3. Installed in Casing: Non-pressure sewer pipe installed in casing will be measured on the same centerline length of casing, in accordance with Section 4.01 and Section 4.12. All non-pressure sewer pipe installed in casing will be measured for depth by averaging the depths of the two ends of the casing, for the various diameters installed and accepted.
4. Special Crossings: Special crossings for which drawings have been made and/or on which a special price has been asked, whether a lump sum bid or otherwise, will be measured accordingly.

B. Payment: The actual total lineal feet of sewer pipe, installed and accepted, will be paid for at the contract unit price bid for sewer pipe of the various sizes and classifications at the various depths, which price and payment shall constitute full compensation for furnishing, hauling and installing the pipe complete, with metallic wire if required; for all excavation, sheeting and bracing (except sheeting and bracing left in place and paid for under other items), backfill and compaction, dewatering, removing surplus earth; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

1. Sewer pipe installed under normal excavation, and installed in casing, will be referred to as "gravity sewer pipe".
2. Sewer pipe installed by jacking and boring will be referred to as "special gravity sewer pipe".

C. Item: Payment will be made under:

- | | |
|--------------------|---|
| Item 02535-4.01(1) | (Size)" (Type) Gravity Sewer Pipe, (Depth Range) Depth, per lineal foot |
| Item 02535-4.01(2) | (Size)" (Type) Special Gravity Sewer Pipe, (Depth Range) depth, per lineal foot |

4.02 SEWER SERVICES

Standard sewer service connections will be paid for by the foot for the various sizes installed.

A. Measurement:

1. Service pipe installed at depths 8 feet and less will be measured as described in Section 4.01.
2. Service pipe installed at depths more than 8 feet will be measured by the actual vertical feet of pipe installed, irrespective of the depth.

B. Payment:

1. Standard sewer service connections, identified as Type "A" on the plans, will be paid for as described in Section 4.01.
2. Standard sewer service connections, identified as Type "B" on the plans, placed, tested and accepted, measured as provided, will be paid for at the contract unit price per vertical foot, which price and payment shall constitute full compensation for furnishing, hauling and installing the pipe complete, with metallic wire if

required, and for all excavation, sheeting and bracing (except sheeting and bracing left in place and paid for under other items), backfill and compaction (except coarse aggregate paid for under other items), removing surplus earth; and for furnishing all labor, tools, equipment and incidentals necessary to complete the item in accordance with the plans and specifications.

C. Item: Payment will be made under:

Item 02535-4.02(1) (Size)" Type "A" Gravity Sewer Service Pipe, per lineal foot;

Item 02535-4.02(2) (Size)" Type "B" Gravity Sewer Service Pipe, per vertical foot;

4.03 NON-PRESSURE PIPE FITTINGS

Non-pressure pipe fittings will be paid for per each according to size and type of fittings, except no separate pay will be established for pipe plugs, adaptors, connectors, etc.

A. Measurement:

1. Single wyes or tees of each size shall be one item.
2. Double wyes or tees of each size shall be one item.
3. Pipe bends of each size shall be one item.

Pipe fittings will be measured irrespective of depth, by an actual count of fittings of the various types and sizes installed and accepted.

B. Payment: Non-pressure pipe fittings placed and accepted, measured as provided, will be paid for at the contract unit price bid for the various types and sizes, which price and payment shall constitute full compensation for furnishing, hauling, and installing complete, for all excavation, backfill and compaction, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

C. Item: Payment will be made under:

Item 02535-4.03 (Size)" x (Size)" (Type of Fittings), per each

4.04 SANITARY SEWER MANHOLES

A. Measurement: Sanitary sewer manholes will be paid for by the actual count per each according to diameter and depth range (0-6 feet, 6-8 feet, 8-10 feet, 10-12 feet, etc.)

Manholes will be measured by the vertical foot and the depth for measurement will be from the top of the manhole casting to the invert of the deepest sewer connecting therewith. Bolted-down frames and covers will be measured separately, per each.

B. Payment: The actual number of manholes installed and accepted, measured as provided, will be paid for at the contract unit price bid per each for manholes to the various depth defined, which price and payment shall constitute full compensation for furnishing, hauling and installing all materials complete, including flexible couplings and waterstops; for all excavation, sheeting and bracing (except sheeting and bracing left in place and paid for under other items), backfill and compaction, removing surplus earth; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications. Where manhole cover vent systems are specified, the vent system shall be included in the price of the manhole. When bolted-down manhole frames and covers are installed, the actual number of each, measured as provided, will be paid for at the contract unit price per each, in addition to the compensation for the manhole. A value as determined by the Engineer may be withheld from payment of manholes due to incomplete work such as inverts, tops, grouting, penetrations, etc.

C. Item: Payment will be made under:

Item 02535-4.04(1) (Size)' Diameter Standard Manholes, (Depth Range) depth, per each

Item 02535-4.04(2) Bolted-down Manhole Frames and Covers, per each

4.05 MANHOLE DROP INLETS

Manhole drop inlets will be paid for by the vertical foot, according to size installed. This item is to cover the additional cost of drop inlet piping and concrete or masonry encasement that connects various sewer lines to manholes. Fittings used in drop inlets shall be measured in accordance with Section 4.03.

- A. **Measurement:** Manhole drop inlets will be measured by the vertical foot according to size installed. The footage will be measured between the invert of the incoming sewer and the invert of the manhole.
- B. **Payment:** Manhole drop inlets placed and accepted, measured as provided, will be paid for at the contract unit price bid per vertical foot, for the various sizes, which price and payment shall constitute full compensation for furnishing, hauling and installing this pipe complete; for all excavation, sheeting and bracing (except sheeting and bracing left in place and paid for under other items), concrete encasements, waterstops, backfill and compaction, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. **Item:** Payment will be made under:
Item 02535-4.05 (Size)" Drop Inlets, per vertical foot

4.06 SANITARY SEWER CLEANOUTS

- A. **Measurement:** Sanitary sewer cleanouts will be measured per each according to size by an actual count of cleanouts installed and accepted. Fittings and caps in the sewer main for cleanouts will be included in the bid price for cleanouts.
- B. **Payment:** Sanitary sewer cleanouts, placed and accepted, measured as provided, will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for furnishing, hauling, and installing all materials complete; for all excavation, backfill and compaction, removing surplus earth; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. **Item:** Payment will be made under:
Item 02535-4.06 (Size)" Cleanouts, per each

4.07 CONNECTIONS TO EXISTING MANHOLES AND SEWER LINES

- A. **Measurement:** Connections to existing manholes and sewer lines will be paid for per each.

Connections to existing sewers by constructing a manhole over the existing sewer will not be measured separately but will be measured as a manhole as specified in Section 4.04.

Connections to existing sewers utilizing fittings will be measured separately and paid for as a connection to an existing sewer. Fittings will be measured separately as specified in Section 4.03.

Connections to existing manholes and sewer lines will be measured by an actual count of connections installed and accepted.
- B. **Payment:** Connections to existing manholes and sewer lines, installed and accepted, measured as provided, will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for locating the existing sewer utility; for furnishing, hauling and installing all materials complete; for all excavation, sheeting and

bracing (except sheeting and bracing left in place and paid for under other items), backfill and compaction, removing surplus earth; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

C. Item: Payment will be made under:

Item 02535-4.07

Connections to Existing Manholes or Sewers, per each

4.08 PRESSURE SEWER PIPE

A. Measurement: Sewer force mains will be paid for by the lineal foot according to size and type. This includes pressure sewer pipe installed by trenchless methods. Measurement for the length of the various types of pressure sewers installed shall be as follows.

1. Normal Excavation: Measurement for the length of pressure sewers will be the actual lineal footage laid within the limits shown on plans for all depths, measured along the top centerline of the pipe. No deduction will be made for fittings and valves.
2. Trenchless: Measurement for the length of pressure sewers installed by trenchless methods shall be:
 - a. from the toe of fore slope to toe of fore slope for street and highway crossings which have open ditch drainage;
 - b. from the back of curb to the back of curb for street and highway crossings with curb and gutter construction;
 - c. for the length shown on the plans for any other trenchless installations.

The Contractor may elect to exceed the limits described above for his convenience in order to avoid inconveniences associated with existing utilities or other reasons, however, measurement will be as described above and additional lengths of special gravity sewer pipe and jack and bore installation for the Contractor's convenience will be at his expense.

3. Installed in Casing: Pressure sewer pipe installed in casing will be measured on the same centerline length of casing, in accordance with Sections 4.11 and 4.12. All pressure sewer pipe installed in casing will be measured for payment at the respective unit price bid for force main for the various diameters installed and accepted.
4. Special Crossings: Special crossings for which drawings have been made and/or on which a special price has been asked, whether a lump sum bid or otherwise, will be measured accordingly.

B. Payment: The actual total lineal feet of force main installed and accepted, measured as provided, will be paid for at the contract unit price bid for force main of the various sizes and classifications, which price and payment shall constitute full compensation for furnishing, hauling, installing complete; including fittings, joint restraint, testing, excavation, sheeting and bracing, (except sheeting and bracing left in place and paid for under other items), backfill and compaction, and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

C. Item: Payment will be made under:

Item 02535-4.08

(Size)", (Type) Sewage Force Mains, per lineal foot

4.09 DUCTILE IRON FITTINGS

A. Measurement: Ductile iron fittings for force mains will be paid for by the ton. Fittings other than ductile iron will not be paid for separately, but will be included in the unit price per

lineal foot of pipe, unless a specific bid price is requested on the Bid Form. Ductile iron fittings will be measured in units of tons of fittings installed, tested, and accepted, and payment for both mechanical joint and push-on joint fittings shall be made on the basis of ANSI/AWWA C153/A21.53 published body weights for mechanical joint fittings exclusive of weight of gaskets and linings, glands and bolts.

- B. Payment:** Ductile iron fittings, placed and accepted, measured as provided above, will be paid for at the contract unit price per ton for ductile iron fittings, which price and payment shall constitute full compensation for furnishing, hauling, installing complete, and testing; for excavation, preparation of bed and backfilling; concrete thrust blocks or anchors; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. Item:** Payment will be made under:
- Item 02535-4.09 Ductile Iron Fittings, per ton

4.10 SPECIAL SEWER STRUCTURES AND APPURTENANCES

- A. Measurement:** Special sewer structures will be paid for per each. Special sewer structures such as conflict boxes, air release valves with vault, etc., as detailed on the plans and listed in the Bid Form will be measured per each, installed and accepted. Valves with valve boxes shall be measured per each, as a unit, installed and accepted.
- B. Payment:** Special sewer structures and appurtenances, such as conflict boxes, air release valves with vault, valves with valve boxes, etc., in place and accepted, measured as provided above, will be paid for at the contract unit price bid per each, which price and payment shall constitute full compensation for furnishing, hauling, and installing all material complete; for all excavation, of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. Item:** Payment will be made under:
- Item 02535-4.10 (Description of special sewer installation) Special Sewer Structures, per each

4.11 CASING PIPE - JACKING AND BORING METHOD

- A. Measurement:** According to specifications and as indicated on the plans, the Contractor shall install pipe casings by jacking and boring to receive the sewage carrier line. Casing pipe, installed and accepted, will be measured by the lineal foot for each of the diameters and thicknesses of casing pipe furnished and installed.
- Measurement will be in the same manner as described for non-pressure sewer pipe, Section 4.01A(2) except that there shall be no provisions for depth. Carrier pipe shall be measured separately, as described in Sections 4.01A(3) and 4.08A(3). However, no separate measurement will be made for carrier pipe insulators, which will be installed on all pressure and non-pressure sewers in casing. The cost of these insulators will be included in the bid price for the casing pipe.
- B. Payment:** The actual total lineal feet of casing, installed and accepted, will be paid for at the contract unit prices for casing pipe of various diameters and thicknesses, which price and payment shall constitute full compensation for furnishing, hauling and installing complete, for all excavation, boring, tunneling, jacking, and backfilling; and for furnishing all materials, equipment, tools, labor and incidentals (including insulators) and the performance of all work necessary to complete the item in accordance with plans and specifications. Carrier pipe shall be compensated separately and shall be measured for depth by averaging the depths of the two ends of the casing, or the respective unit price for force main, as the case may be, for the diameters installed and accepted, which price and payment shall constitute full compensation for furnishing, hauling and installing complete.

- C. **Item:** Payment will be made under:

Item 02535-4.11 (Size)" x (Wall Thickness)" Welded Steel Casing Pipe, Jacked and Bored, per lineal foot

4.12 CASING PIPE - BY OPEN CUT

- A. **Measurement:** According to these specifications and as indicated on the plans, the Contractor will install pipe casings, by open cut method, to receive the sewer line. Casing pipe installed and accepted, will be measured by the lineal foot for each of the diameters and thicknesses furnished and installed. The quantity obtained will be the centerline length of the casing installed and accepted. In addition, the carrier pipe installed and accepted shall be measured for separate payment and will be measured for depth by averaging the depths of the two ends of the casing. However, no separate measurement will be made for carrier pipe insulators, which will be installed on all pressure and non-pressure sewers in casing. The cost of these insulators will be included in the bid price for the casing pipe.

- B. **Payment:** The actual total lineal feet of casing, installed and accepted, will be paid for at the contract unit price for casing pipe of various diameters and thicknesses, which price and payment shall constitute full compensation for furnishing, hauling and installing complete; for all excavation and backfilling; and for furnishing all materials, equipment, tools, labor and incidentals (including insulators), and the performance of all work necessary to complete the item in accordance with plans and specifications. Carrier pipe shall be compensated separately and shall be measured for depth by averaging the depths of the two ends of the casing, or the respective unit price for force main, as the case may be, for the diameter(s) installed and accepted, which price and payment shall constitute full compensation for furnishing, hauling and installing complete.

- C. **Item:** Payment will be made under:

Item 02535-4.12 (Size)" x (Wall Thickness)" Welded Steel Casing Pipe, By Open Cut, per lineal foot

4.13 INSTALLING PIPE - TRENCHLESS METHODS

- A. **Measurement:** Installing pipe by trenchless methods either by jacking and boring (gravity sewer) or by horizontal directional drilling (pressure sewers) will be measured by the lineal foot according to the size of pipe installed. Measurement will be as described in Section 4.01A(2) for non-pressure sewer pipe, or Section 4.08A(2) for pressure sewers.

- B. **Payment:** The cost of installing by trenchless methods will be paid for at the contract unit price for installing pipe of various diameters, which price and payment shall constitute full compensation for installing complete; for all excavation, boring, jacking, and backfilling; and for furnishing all equipment, tools, labor and incidentals, and the performance of all work necessary to complete the item in accordance with plans and specifications.

The pipe shall be compensated separately and will be measured as described in Section 4.01A(2) for non-pressure sewer pipe, or Section 4.08A(2) for pressure sewers, as the case may be, for the various diameters installed and accepted, which price and payment shall constitute full compensation for furnishing, hauling and installing complete.

- C. **Item:** Payment will be made under:

Item 02535-4.13 (1) (Size)" (Type) Installing gravity sewer pipe, jacked and bored, per lineal foot;

Item 02535-4.13 (2) (Size)" (Type) Installing pressure sewer pipe, Horizontal Directional Drilling, per lineal foot

4.14 STANDARD PIPE FOUNDATIONS

- A. **Measurement:** Except as provided for in Section 4.16, no separate measurement will be made for standard pipe foundations installed within the pipe zone, as specified in Part 3, or shown on the plans, unless modified by the General Requirements.
- B. **Payment:** Except as provided for in Section 4.16A, no special payment shall be made for standard pipe foundations as specified in Part 3 or shown on the plans, unless modified by the General Requirements.

4.15 SPECIAL PIPE FOUNDATIONS

- A. **Measurement:** Special foundations or pipe supports will be measured per cubic yard or per lineal foot by the type of foundation specified. Special foundations or pipe supports will be measured in place as called for in the bid schedule.

Coarse aggregate special foundations, outside the pipe zone, will be measured by the cubic yard, placed and accepted, and shall be the theoretical volume of compacted special foundation material below the pipe zone. The trench width for determining the volume shall be the actual width of the trench or the maximum width shown in 4.16A(2) below whichever is smaller. Widths in excess of those shown unless otherwise authorized, will be considered excessive, and the calculation shall be limited to the widths shown.

- B. **Payment:** Special foundations or pipe supports, in place and accepted, will be paid for at the contract unit price per cubic yard or per lineal foot, which price and payment shall constitute full compensation for furnishing, hauling and installing all material, and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. **Item:** Payment will be made under:
- Item 02535-4.15 (1) (Type) Special Pipe Foundation, per lineal foot
- Item 02535-4.15 (2) (Type) Special Pipe Foundation, per cubic yard

4.16 SPECIAL BACKFILL

- A. **Measurement:** Measurement shall be as follows:

1. Coarse aggregate or select backfill, required in the pipe zone as either bedding, haunching or initial backfill material (except as provided in (3), below or required as part of the standard foundation for non-pressure sewer), will only be measured for separate payment when the trench excavation material is unsuitable, in any horizon, to conform to the backfill requirements, as specified in Section 3.04 or when otherwise authorized by the Engineer.

Measurement for payment shall be the theoretical solid volume of pipe zone receiving the special backfill after deducting the volume occupied by the pipe. The width for determining the theoretical volume shall be the actual width of the pipe zone but limited to the maximum pipe zone width indicated by the standard non-pressure sewer foundation detail of the contract drawings. No measurement will be made for overwidths unless specifically authorized by the Engineer.

2. Select backfill, outside the pipe zone, will be measured by the cubic yard, placed and accepted, and shall be the theoretical volume of compacted special backfill material above the top of the pipe zone. The trench width for determining the volume shall be the actual width of the trench or the maximum widths shown below whichever is smaller. Widths in excess of those shown in the following table including sloping the upper portion of the trench, unless otherwise authorized on the plans or in these specifications, will be considered excessive, and the calculation shall be limited to the widths shown.

Maximum Trench Width Above Pipe Zone Based on Pipe Size & Depth			
Size of Pipe	0' – 5'	+5' – 12'	+12' – 30'
4"	3'-0"	6'-0"	8'-0"
6"	3'-0"	6'-0"	8'-0"
8"	3'-6"	6'-0"	8'-0"
10"	3'-6"	6'-0"	8'-0"
12"	3'-6"	8'-0"	10'-0"
15"	4'-0"	8'-0"	10'-0"
18"	4'-0"	8'-0"	10'-0"
24"	4'-6"	8'-0"	12'-0"
27"	5'-0"	8'-0"	12'-0"
30"	5'-0"	8'-0"	12'-0"

3. Coarse aggregate required for Type "B" service connections will be measured for separate payment by the vertical foot of 4" and 6" diameter service pipe installed and accepted.

B. Payment: Special backfill payment will be as follows:

1. Coarse aggregate or select backfill, in the pipe zone, in place and accepted, will be paid for at the contract unit price per cubic yard of coarse aggregate or select backfill, which payment shall constitute full compensation for furnishing, hauling, and installing all material, and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
2. Select backfill, outside the pipe zone, in place and accepted, will be paid for at the contract unit price per cubic yard, which price and payment shall constitute full compensation for furnishing, hauling, and installing all material, and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
3. Coarse aggregate required for Type "B" service connections, in place and accepted, will be paid for at the contract unit price for gravel encasement for house service connections, Type "B", per vertical foot of 4" and 6" diameter service pipe installed and accepted.

C. Item: Payment will be made under:

- Item 02535-4.16 (1) Coarse Aggregate Backfill, per cubic yard
- Item 02535-4.16 (2) Select Backfill, per cubic yard
- Item 02535-4.16 (3) Type "B" Service Coarse Aggregate Backfill per vertical foot

4.17 SHEETING AND BRACING LEFT IN PLACE

- A. Measurement:** Sheeting and bracing left in place at the written direction of the Engineer will be measured by units of one thousand (1,000) board feet and fractions thereof.
- B. Payment:** Sheeting and bracing left in place, as directed by the Engineer in writing, installed and accepted, will be paid for at the contract unit price per thousand board feet,

which price and payment shall constitute full compensation for furnishing, hauling and installing all sheeting and bracing required to be left in place and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

C. Item: Payment will be made under:

Item 02535-4.17 Sheeting and Bracing Left in Place, per thousand board feet

4.18 REMOVAL AND REPLACEMENT OF HIGHWAY, STREET, DRIVEWAY AND SIDEWALK PAVEMENT AND CURBS

A. Measurement: In cases where no other practical method for installing pipe under improved surfaces is available, the Contractor will be permitted to make such installation by the open trench method. The Contractor will be paid for this work on the basis of the contract unit price for furnishing and laying pipe plus the extra price bid under this item for removing and replacing the various types of improved surfaces.

Removal and replacement of street, highway, driveway, and sidewalk pavement will be measured by the square yard, and the area for measurement shall be as shown on the plans or as specified in the specifications. Unless otherwise provided in the General Requirements or on the Bid Schedule, separate measurements will be made for:

1. concrete over trenches
2. removal and replacement of concrete street surfaces
3. removal and replacement of asphalt street surfaces

If the street surfacing extends beyond the trench limits, the measurement will be based on the total surface replaced.

Removal and replacement of surfacing of gravel or shell streets and driveways cut by trenches for installation of pipe will be measured by the square yard or cubic yard of gravel or shell placed, bladed and accepted. Gravel or shell will be placed only at the direction of the Engineer, and actual invoice records on quantities of material placed will be used for measurement.

Removal and replacement of concrete curbs will be measured by the lineal foot, and the length of measurement shall be as indicated on the plans or in the specifications.

B. Payment: Removal and replacement of highway, street, driveway and sidewalk pavement in place and accepted will be paid for at the contract unit price per square yard for the various types of improved wearing surfaces. Removal and replacement of surfacing of gravel or shell roads in place, bladed and accepted will be paid for at the contract unit price per square yard or cubic yard of gravel or shell. Removal and replacement of concrete curbs, in place and accepted, will be paid for at the contract unit price per lineal foot.

These prices and payment shall constitute full compensation for furnishing, hauling and installing all materials; for excavation and backfill compaction; subgrade preparation; finishing and curing; and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.

Unless otherwise provided in the General Requirements or on the Bid Schedule, separate payment will be made for:

1. concrete over trenches
2. removal and replacement of concrete street surfaces
3. removal and replacement of asphalt street surfaces

C. Item: Payment will be made under:

- Item 02535-4.18 (1) Removal and Replacement of (Type) Surfaces, per square yard
- Item 02535-4.18 (2) Removal and Replacement of (Type) Surface, per cubic yard
- Item 02535-4.18 (3) Removal and Replacement of Concrete Curbs, per lineal foot
- Item 02535-4.18 (4) Removal and Replacement of Concrete Over Trench, per square yard

4.19 IMPROVED SURFACES TO BE SAWED

- A. **Measurement:** Concrete or asphalt surfaces to be sawed will be paid for by the lineal foot. Concrete or asphalt surfaces to be sawed will be measured by the actual lineal foot sawed. (Note: When sawing both sides of a trench, both sides will be measured).
- B. **Payment:** Concrete or asphalt surfaces sawed, approved and accepted, will be paid for at the contract unit price per lineal foot for this item, which price and payment shall constitute full compensation for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. **Item:** Payment will be made under:
 - Item 02535-4.19 Sawing Concrete Surfaces, per lineal foot

4.20 CLEARING AND GRUBBING

- A. **Measurement:** Clearing and grubbing will be paid for by either lump sum basis or by the acre or as part of another bid item. Measurement will be by one or more of the following alternate methods when a separate bid item is used:
 - 1. Area Basis: The work to be paid for will be the number of acres and fractions thereof acceptably cleared, grubbed, selectively cleared, or cleared and grubbed within the limits shown on the plans or staked for clearing and grubbing by the Engineer. Areas not shown on the plans, or not staked for clearing and grubbing will not be measured for payment.
 - 2. Lump Sum Basis: When the bid schedule contains a clearing and grubbing lump sum item, no measurement of area will be made.
 - 3. If no bid item is listed in the bid form, payment shall be included in other items.
- B. **Payment:** The accepted quantities of clearing and grubbing will be paid for per acre or per lump sum for this item, which price and payment shall constitute full compensation for furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with plans and specifications.
- C. **Item:** Payment will be made under:
 - Item 02535-4.20 (1) Clearing and Grubbing, per acre
 - Item 02535-4.20 (2) Clearing and Grubbing, lump sum

4.21 SPECIAL LUMP SUM - RAILROAD CROSSINGS, ROADWAY CROSSINGS, CANAL CROSSINGS AND LEVEE CROSSINGS, ETC.

- A. **Measurement:** Crossings for which separate lump sum prices are requested will be paid for per each. The price shall be for a complete installation as specified and detailed on the plans. All lump sum crossings will be measured by an actual count of each crossing installed and accepted.
- B. **Payment:** Special lump sum crossings in place and accepted will be paid for at the contract lump sum price which price and payment shall constitute full compensation for furnishing, hauling, and installing all material, and for furnishing all equipment, tools, labor

and incidentals necessary to complete the item in accordance with plans and specifications.

- C. **Item:** Payment will be made under:

Item 02535-4.21 (Description of Crossing) Crossing, per lump sum

4.22 METALLIC WIRE

- A. **Measurement:** No separate measurement for will be made for metallic wire installed and accepted on non-metallic or non-conductive underground facilities. The cost of metallic wire will be included in other items, or the item of which it is a part.

- B. **Payment:** No separate payment will be made for metallic wire installed and accepted on non-metallic or non-conductive underground facilities. The cost of metallic wire shall be included in other items, or the item of which it is a part.

4.23 ELECTRONIC MARKER LOCATOR

- A. **Measurement:** Electronic marker locators will be paid for per each, furnished and accepted, and will be measured accordingly.

- B. **Payment:** Electronic marker locators, furnished and accepted, will be paid for at the contract unit price per each, which price and payment will be full compensation for furnishing and demonstrating its workability.

- C. **Item:** Payment will be made under:

Item 02535-4.23 Electronic Marker Locator, per each

4.24 SERVICE CONNECTION MARKER

- A. **Measurement:** Service connection markers will be paid for per each, installed and accepted, and will be measured accordingly.

- B. **Payment:** Service connection markers, installed and accepted, will be paid for at the contract unit price per each, which price and payment will be full compensation for furnishing, installing and demonstrating workability, and for all excavation, backfill and compaction, removing surplus earth, and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.

- C. **Item:** Payment will be made under:

Item 02535-4.24 Service Connection Marker, per each

4.25 REMOVAL AND REPLACEMENT OF DRIVEWAY CULVERT PIPE

- A. **Measurement:** No measurement will be made for labor and equipment necessary for removal and replacement of existing or new culvert pipes. Measurement will be made for new materials only, furnished and installed. No measurement will be made for materials lost, stolen, damaged or otherwise deemed unusable.

- B. **Payment:** No separate payment will be made for the labor and equipment necessary for the removal, replacement, disposal or stockpiling existing or new culvert pipe. All labor and equipment required will be included in the price bid for installing sewer facilities. Separate payment will be made for new culvert pipe and accessories furnished at the actual invoiced cost including sales tax for the replacement materials installed and accepted. No add-ons for overhead, handling, profit, etc. will be allowed. Payment will be made under the cash allowance item established in the bid form.

- C. **Item:** Payment will be made under:

Item 02535-4.25 Cash Allowance for Reimbursement of Material and Costs for Culverts, \$ _____

4.26 REMOVAL AND REPLACEMENT OF FENCES

- A. **Measurement:** No measurement will be made for labor and equipment necessary for removal and replacement of existing or new fences. Measurement will be made for new materials only, furnished and installed. No measurement will be made for materials lost, stolen, damaged or otherwise deemed unusable.
- B. **Payment:** No separate payment will be made for the labor and equipment necessary for the removal or replacement of existing or new fences. All such costs will be included in other bid items for installing the sewer facilities. Separate payment will only be made for the new fence materials and accessories furnished at the actual invoiced cost including sales tax for the replacement materials installed and accepted. No add-ons for overhead, handling, profit, etc. will be allowed. Payment will be made under the cash allowance item established in the bid form.
- C. **Item:** Payment will be made under:
Item 02535-4.26 Cash Allowance for Reimbursement of Material and Costs for Fences, \$_____

4.27 REMOVAL AND REPLACEMENT OF STRUCTURAL CONCRETE

- A. **Measurement:** The measurement of structural concrete shall be the theoretical volume in cubic yards of the new structure. All steel and appurtenances shall be included at no additional cost. No measurement of formwork will be made.
- B. **Payment:** Structural concrete shall be paid for by the cubic yard of measured and accepted concrete for headwalls, catch basins, retaining walls, etc. Payment shall constitute full compensation for removal and replacement of structural concrete.
- C. **Item:** Payment will be made under:
Item 02535-4.27 Structural Concrete, per cubic yard

4.28 TESTING GRAVITY SEWERS

- A. **Measurement:** Testing of gravity sewer pipe, completed and accepted, shall be measured per lineal foot of gravity sewer mains, regardless of size or depth and without deduction for fittings or manholes. No measurement will be made for house services although included in the leakage test.

The tests for gravity sewers shall include three (3) elements as follows:

1. Alignment test per Section 3.23.
2. Field leakage test per Section 3.25.
3. Deflection test per Section 3.26 unless excluded by the General Requirements.

- B. **Payment:** Testing of gravity sewer pipe, completed, accepted and measured as provided herein shall be paid at the contract unit price bid per lineal foot, which price and payment shall constitute full compensation for furnishing all materials, tools, equipment, supplies, labor and incidentals necessary to complete the testing in accordance with the contract requirements.

The unit price bid shall not be less than the minimum bid price established on the bid form. Should the Contractor fail to bid a unit price of at least the minimum established bid price, the Notice of Award will be conditioned that a change order be issued reducing the unit price of the gravity sewer pipe bid items by the amount of the deficit and increasing the unit price for testing whereby the total contract amount is unchanged.

No payment will be made for testing until all elements of the required testing are satisfactorily completed.

Should a section of line fail any element of the required tests and if the repairs and retests are not satisfactorily completed within 20 calendar days of the failed test, a deduction for the failed section of line shall be applied to the next partial payment estimate. The Engineer will determine the value of the deduction. All costs to repair the defective work and retest the failed sections shall be the responsibility of the Contractor. The value of the deduction withheld shall be included in the next partial payment estimate after all defects are satisfactorily corrected and retested.

C. Item: Payment will be made under:

Item 02535-4.28 Testing Gravity Sewers, per lineal foot, (minimum acceptable bid price, _____ per LF)

4.29 TESTING FORCE MAINS

A. Measurement: Testing of force main pipe, completed and accepted, shall be measured per lineal foot regardless of size from the point of origin to the point of discharge without deduction for fittings, valves, bores, or special crossings.

B. Payment: Testing of force main pipe, completed and accepted and measured as provided herein shall be paid at the contract unit price bid per lineal foot, which price and payment shall constitute full compensation for furnishing all materials, tools, equipment, supplies, labor and incidentals necessary to complete the testing in accordance with the contract requirements.

The unit price bid shall not be less than the minimum bid price established on the bid form. Should the Contractor fail to bid a unit price of at least the minimum established bid price, the Notice of Award will be conditioned that a change order be issued reducing the unit price of the force main pipe bid items by the amount of the deficit and increasing the unit price for testing whereby the total contract amount is unchanged.

No payment will be made for testing until all elements of the required testing are satisfactorily completed.

Should a section of line fail the required test and if the repairs and retests are not satisfactorily completed within twenty (20) calendar days of the failed test, a deduction for the failed section of line shall be applied to the next partial payment estimate. The Engineer shall determine the value of the deduction. All costs to repair the defective work and retest the failed sections shall be the responsibility of the Contractor. The value of the deduction withheld shall be included in the next partial payment estimate after all defects are satisfactorily corrected and retested.

C. Item: Payment will be made under:

Item 02535-4.29 Testing Force Mains, per lineal foot,(minimum acceptable bid price, _____per LF)

4.30 CLEANUP, MAINTENANCE AND FINAL RESTORATION

A. Measurement: Cleanup, maintenance and final restoration, completed and accepted, will be measured per lineal foot of gravity sewer mains or force mains regardless of size without deductions for fittings, manholes, valves, bores, or special crossings. No measurement will be made for house services. No measurement will be made for gravity mains or force mains which are identified as part of lump sum items such as lift stations or other structures identified as including cleanup, maintenance, and final restoration. Where gravity mains and/or force mains are installed parallel, within 20 feet of each other, and not separated by a street, road or alley, measurement will include only one utility length. Measurement for cleanup will be limited to the length of the utility from point of origin to the end of the utility main.

- B. Payment:** Cleanup, maintenance and final restoration completed, accepted and measured as provided herein shall be paid at the contract unit price bid per lineal foot which price shall constitute full compensation for furnishing all labor and equipment to complete the work in accordance with the contract requirements and to the satisfaction of the Engineer and Owner. Separate payment will be made for furnishing and installing materials required by the contract to maintain streets and driveways exclusive of backfill, signs, barricades and markers. Separate payment will also be made for repair of paved surfaces and unimproved surfaces in accordance with the contract requirements. Partial payment for cleanup, maintenance and final restoration as provided herein, will only be made when Substantial Completion is obtained.

At the time of Substantial Completion, a value for the punch list items will be determined by the Engineer and applied as a deduction against the cleanup, maintenance and final restoration item. If the cleanup item is of sufficient value to cover the punch list value, then the balance will be paid on the next payment estimate. If the cleanup item is not sufficient, additional deduction will be applied to other items.

The unit price bid for cleanup, maintenance and final restoration will not be less than the minimum bid price established on the bid form. Should the Contractor fail to bid a unit price of at least the minimum established bid price, the Notice of Award will be conditioned that a change order be issued reducing the unit price of the gravity sewer pipe and force main bid items by the amount of the deficit and increasing the unit price for cleanup whereby the total contract amount is unchanged.

- C. Item:** Payment will be made under:

- Item 02535-4.30 (1) Cleanup, Maintenance and Final Restoration of Gravity Sewers, per lineal foot, (minimum acceptable bid price, _____ per LF);
- Item 02535-4.30 (2) Cleanup, Maintenance and Final Restoration of Force Mains, per lineal foot, (minimum acceptable bid price, _____ per LF)

4.31 TEST PITS

- A. Measurement:** Measurement for payment of test pits for location of existing utilities shall be the actual volume obtained by field measurement of the length, width and depth of excavation necessary to determine the information required by the Engineer.
- B. Payment:** Payment for test pits for location of existing utilities shall be at the contract unit price per cubic yard, which price and payment shall constitute full compensation for furnishing all equipment, tools, labor and incidentals necessary to complete the work in accordance with the plans and specifications.
- C. Item:** Payment will be made under:
- Item 02535-4.31 Test Pits, per cubic yard

4.32 MANHOLE INSERTS

- A. Measurement:** Manhole inserts will be paid for per each, installed and accepted, and will be measured accordingly.
- B. Payment:** Manhole inserts, installed and accepted, will be paid for at the contract unit price per each, which price and payment shall be full compensation for furnishing, hauling and installing, and for furnishing all equipment, tools, labor and incidentals necessary to complete the item in accordance with the plans and specifications.
- C. Item:** Payment will be made under:
- Item 02535-4.32 Manhole Inserts, per each

END OF SECTION 02535

SECTION 02555
GAS DISTRIBUTION

PART 1 – GENERAL

1.01 DESCRIPTION

This item shall consist of gas pipe, including service lines to a point shown on the drawings, and fittings, together with valves, valve boxes, regulators, and other appurtenances necessary to construct the gas distribution system for the project. Included shall be the furnishing and installation of all materials, testing, purging, and odorizing at such places as are designated on the drawings or by the Engineer, in accordance with these specifications and in conformity with the lines and grades given.

This item shall include, in the bid prices per unit requested, the cost of common excavation and backfill, the cost of furnishing and installing all trench bracing and dewatering, and the material for and making of all joints.

1.02 LOCATION OF LINES

The approximate location of lines, valves, regulators and other appurtenances has been indicated on the drawings as being within the bounds of street, highway, or easement rights-of-way. Final locations of the various items of construction shall be established in the field by the Engineer.

All costs not specifically listed as a pay item shall be included in the price bid for the item of which the costs are a part.

1.03 LAYOUT OF WORK

Layout of the work shall be as specified in the General Requirements of these specifications.

1.04 LOUISIANA DEPARTMENT OF HIGHWAYS PERMIT

Unless otherwise noted, the Owner will secure the necessary permit from LADOTD for laying these lines. The Contractor shall comply with all provisions and requirements of the permit.

1.05 PARISH PERMIT

Unless otherwise noted, the Owner will secure the necessary parish permit for laying these lines. The Contractor shall comply with all provisions and requirements of the permit.

1.06 RAILROAD PERMIT

Unless otherwise noted, the Owner will secure the necessary railroad permit for laying these lines. The Contractor shall comply with all provisions and requirements of the permit.

1.07 REFERENCE STANDARDS

The transport of natural gas by pipeline shall conform to the Natural Gas Pipeline Safety Act of 1968. The Act required the U.S. Department of Transportation, (D.O.T.) Office of Pipeline Safety (OPS) to develop and enforce minimum safety regulations for the transportation of natural gas by pipeline. The regulations became effective in 1970 and are published in Title 49, Code of Federal Regulations, Parts 190, 191, and 192. Other publications (latest revisions), listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references.

- A. AASHTO M 190 - Bituminous Coated Steel Pipe
- B. American Gas Association.... Plastic Pipe Manual for Gas Service
- C. ANSI..... B1.20.1 - Pipe Threads, General Purpose (Inch)
- D. ANSI B16.3 Malleable Iron Threaded Fittings, Class 150 and 300
- E. ANSI B16.5 Steel Pipe Flanges and Flanged Fittings
- F. ANSI B16.9 Factory Made Wrought Steel Butt Weld Fittings
- G. ANSI B16.33 Manually Operated Metallic Gas Valves for Use in Gas Systems up to 125 psig
- H. ANSI B31.8 Gas Transmission and Distribution Piping Systems
- I. ANSI B31.8a Addenda to ANSI B31.8
- J. API Specifications 5 L - Specification for Line Pipe
- K. API 5LE Specification for Polyethylene Line Pipe
- L. API 6D Pipeline Valves, End Closures, Connectors and Swivels
- M. API Standard 1104..... Standard for Welding Pipelines and Related Facilities
- O. A.R.E.A Manual for Railway Engineering
- P. ASME Boiler and Pressure Vessel Code and Interpretation: Section IX, Welding Brazing Qualifications
- R. ASME Guide for Gas Transmission and Distribution Piping Systems
- S. ASTM Standard A 53 Black and Hot-Dipped Zinc-Coated, Welded and Seamless Steel Pipe
- T. ASTM A 120..... Black and Galvanized Welded and Seamless Pipe for Ordinary Uses
- U. ASTM A 181 Carbon Steel Forgings for General Purpose Piping
- V. ASTM A 216..... Carbon Steel Castings Suitable for High Temperature Service
- W. ASTM A 234..... Factory Made Wrought Carbon Steel and Ferritic Alloy Steel Welded Fittings
- X. ASTM D 1598..... Time-To-Failure of Plastic Pipe Under Constant Internal Pressure
- Y. ASTM D 2274..... Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
- Z. ASTM D 2513..... Thermoplastic Gas Pressure Piping Systems
- AA. ASTM D 3350..... Polyethylene Plastics Pipe and Fittings Materials

- BB. Louisiana Standard Specifications for Roads and Bridges, 2006 Edition
- CC. MSS SP-25 Standard Marking System for Valves, Fittings, Flanged and Unions
- DD. MSS SP-44 Steel Pipe Line Flanges
- EE. MSS SP-84 Steel Valves - Socket Welded and Threaded Ends
- FF. NACE Standards RP-01-69 - Recommended Practice - Control of External Corrosion on Underground or Submerged Metallic Piping Systems
- GG. NACE RP-02-74 Recommended Practice - High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation
- HH. NACE RP-02-75 Application of Organic Coatings to the External Surface of Steel Pipe for Underground Service
- II. NAPCA Specifications Bulletins 1-65-91 thru 15-83-90 Pocket Edition of NAPCA Specifications and Plant Coating Guide
- JJ. USAS B 16.3 Malleable-Iron Screwed Fittings, 150 and 300-Pound Class
- KK. USAS B 16.5 Steel Pipe Flanges and Flanged Fittings
- LL. USAS B 31.8 Gas Transmission and Distribution Piping Systems
- MM. US DOT, OPS 49 CFR, Parts 40 and 199 Drug Testing

1.08 RELATED WORK

- A. 03301 - Concrete for General Construction
- B. 02900 - Sodding

PART 2 - MATERIALS

2.01 PIPE MATERIALS AND INSTALLATION

Pipe and other materials shall be of the type called for on the drawings, and shall be in accordance with the following appropriate requirements. Wherever it is necessary to join two pipes of dissimilar metals together, a method of insulating against the passage of electric current shall be provided and shall be approved by the Engineer.

The Contractor shall comply with drug testing requirements of 49 CFR, Parts 40 and 199, latest revision.

2.02 PIPE SHIPPING AND DELIVERY

The pipe manufacturer shall take the necessary steps in handling and shipping the pipe as not to injure the pipe, coating, or lining. Each joint of new steel and/or polyethylene gas pipe shall be individually stacked and secured on the truck or railroad car bed with adequate support under each joint of pipe and adequate support and protection between each layer of pipe stacked on the vehicle.

2.03 HANDLING OF ALL PIPE

The Contractor shall handle all pipe with handling and hauling equipment as not to injure the pipe, pipe lining, or pipe coating. Any pipe pushed off the truck bed will be rejected. Adequate equipment shall be used by the Contractor to remove the pipe from the truck bed and string it along the trench location.

If the pipe is to be stock piled before it is strung along the trench, the Contractor shall stack the pipe on a level site in neat stacks. Steel gas pipe shall be stacked using the supports which were used in transporting the pipe. Polyethylene gas pipe shall be stacked in the bound bundles that the pipe was shipped in and the bundles shall not be broken until the stringing operation is started.

2.04 STEEL PIPE, JOINTS, FITTINGS

- A. Steel Gas Pipe: Steel gas pipe shall be new and conform to the requirements of ASTM A 53, Grade B, Type E or S; or API Specification 5L, Grade B, line pipe, seamless or electric-resistance-welded, black; wall thickness as required to meet ANSI B31.8. New steel pipe shall be in lengths, not less than 20 feet long, with plain ends beveled for welding.

The exterior of the pipe shall have 11 mil minimum thickness "Scotchkote," type 3M 206N, Fostercoat, or approved equal, plant applied fusion bonded epoxy coating meeting the specifications contained in NAPCA Bulletin 12-78-90, and subsequent revisions thereto.

Each length of steel pipe shall be marked in accordance with API Specification 5L, namely to show name or mark of the manufacturer; pipe size (outside diameter) in inches; weight per foot; grade; API Monogram; pipe length; process of manufacturer; type of steel; heat treatment and hydrostatic test pressure.

All steel gas pipe shall be of domestic manufacture and shall be standard Schedule 40, with a weight and wall thickness as follows:

<u>Size (Inch)</u>	<u>Weight (lbs./L.F.)</u>	<u>Wall Thickness (Inches)</u>
10	40.48	0.365
8	28.55	0.322
6	18.97	0.28
4	10.79	0.237
3	7.58	0.216
2	3.652	0.154
1½	2.717	0.145
1	1.678	0.133
¾	1.13	0.113

- B. Joints: Joints for steel gas pipe shall be butt-welded to develop a joint that will result in complete fusion throughout the entire wall thickness of the pipe. All butt-welds shall be full penetration single butt-welds in accordance with D.O.T. Part 192 and API Standard 1104. Welded joints shall satisfactorily hold any pressure that the line will be subjected to in testing or during operation at maximum design pressure. Miter joints shall be limited to pipe connections where commercially fabricated welding fittings cannot be used.

All threaded pipe, nipples, fittings, union, and couplings shall be made up tight to valves, regulators, meters using Rector Seal No. 5 pipe dope, graphite joint sealing compounds for gas service listed in Underwriters Laboratories, Inc. Gas and Oil Equipment Directory, Class 20 or less, polytetrafluoroethylene tape, which conforms to Mil-T-27730, or approved equal.

- C. Fittings: Steel gas pipe threaded fittings shall conform to ANSI B16.3 or B16.11, black. Steel gas pipe butt-welded fittings shall conform to ANSI B16.9 and shall be commercially fabricated ASTM A234 steel fittings of pressure rating equal to or greater than ANSI Class 150 standards. All pipe bends shall be long radius type. The exterior of all bends and fittings shall have the same coating as the pipe. Where reduction of size in pipes occur concentric swage fittings shall be used. Steel gas pipe flanged fittings shall conform to ANSI B16.5.

Steel gas pipe forged branch connections shall conform to ASTM A 181 Class 60, steel. Steel gas pipe threads shall conform to ANSI B1.20.1.

- (1) P.E. to Steel Transition Fitting: The P.E. to steel transition fitting shall be manufactured by the same manufacturer of the P.E. piping supplied for the system. The P.E. ends of the fitting shall conform to paragraph 2.04.A of these specifications. The fitting shall be manufactured by Wayne Manufacturing, Central Plastics, or approved equal.

Upon completion of welding operations for the transition fitting, the steel ends of the fitting shall be thoroughly coated as specified in paragraph 3.12.E of these specifications. The cost for installation of each such transition fitting shall be included in the unit price bid for associated items of work.

- (2) Stopple Fitting: Stopple fittings (short stop) shall be manufactured by T.D. Williamson, Inc., Mueller Co., or approved equal, and consist of a pipe cap, completion plug, and a shaped steel nipple. The stopple fitting shall be designed to conform to ANSI Class 150 standards. The stopple fitting shall be used to effectively stop-off piping under pressure. The Contractor shall be required to provide all the necessary tapping and plugging equipment required to install the stopple. Unless shown otherwise on the Drawings, all stopple fittings shall be welded connections. Where indicated, the stopple shall be mechanically fitted.

The cost for installation of each stopple fitting and the cost of any required tapping and plugging equipment shall be included in the unit price bid for hot tap connections.

- (3) Three-way Tee Fitting: Three-way tee fittings shall be manufactured by T.D. Williamson, Inc., Mueller Co., or approved equal, and consist of a forged steel blind flange with gaskets, nuts and bolts, a cast iron completion plug, and a cast steel fitting meeting ASTM A216 Grade WCB for 4" and larger sizes and consist of a pipe cap, completion plug, and three-way tee with external pipe threads, shaped to fit the pipe for 3" and smaller sizes. The fitting shall be designed to conform to ANSI Class 150 standards. The tee shall be used to connect new lines to existing steel lines that are to remain in service.

The Contractor shall provide all necessary tapping and plugging equipment required to install the three-way tee fitting. Unless shown otherwise on the Drawings, all three-way tees shall be for welded connections. Where indicated, the tees shall be mechanically fitted. The cost for installation of each three-way tee and the cost of any required tapping and plugging equipment shall be included in the unit price bid for hot tap connections.

- D. Bolts, Nuts, Etc.: Bolts shall be as specified by the USAS B31.8 specification for bolted joints or as recommended by the pipe manufacturer; bolts on flanged pipe installed underground shall be made from a non-corrosive metal.

2.05 THERMOPLASTIC GAS PRESSURE PIPE, JOINTS, FITTINGS

- A. Thermoplastic Gas Pressure Pipe: All thermoplastic gas pressure pipe furnished shall be polyethylene (P.E.) plastic pipe and shall conform in all respects to ASTM D-2513. Pipe shall be Driscopipe 8100 Series or approved equal.

Polyethylene plastic pipe shall be manufactured from a virgin polyethylene plastic compound material which meets ASTM Specification D 2513 for use with natural gas, and has the primary physical properties which are identified by cell classification P.E. 345564C in accordance with ASTM D3350 and has been listed by the Plastic Pipe Institute (PPI) as a P.E. 3408 designated compound. All P.E. pipe shall be of a single manufacturer. All P.E. plastic pipe shall be SDR 11 unless otherwise specified. The pipe shall be furnished in Iron Pipe Size (IPS). The outside shell color of all P.E. gas pipe material shall be yellow.

All P.E. pipe shall have the manufacturer's name or trademark, the nominal pipe size, the PPI plastic pipe designation code, and the Standard Dimensional Ratio (SDR) or wall thickness conspicuously marked at intervals of not more than 2 feet.

- B. Joints: Joints shall be made using butt heat-fusion or electrofusion equipment and instructions provided by or recommended by the pipe manufacturer. Butt heat-fusion joints will require the use of a jointing device that holds the heater element square to the ends of the piping, can compress the heated ends together, and holds the piping in proper alignment while the plastic hardens. Electrofusion joints shall be used for gas service line connections to the gas main, as provided for in Paragraph 2.10.A of these specifications.
- C. Fittings: All polyethylene gas pipe fittings shall conform to ASTM Specification D 2513 and paragraph 2.05.A of these specifications. P.E. to steel transition fittings shall be as specified in paragraph 2.04.C(1) of these specifications.

2.06 SERVICE LINE

Gas service lines shall be a minimum of 3/4" diameter and shall conform to Paragraph 2.05.A of these specifications. All service lines shall extend from the gas main to, and including, the point of delivery. The point of delivery is the service meter stop. The service line shall be coated and wrapped from the bottom of the service meter stop or a point at least 1 foot above ground level to a point at least 1 foot below the ground level.

2.07 WELDED STEEL CASING PIPE

Steel casing pipe shall be new and conform to the requirements of ASTM A 53, Grade 13, Type E or API Specification 5L, Grade B., line pipe, seamless or electric-resistance-welded, black. Steel casing pipe shall be in lengths, not less than 20 feet long, with plain ends beveled for welding. The size and wall thickness shall be as specified on the drawings.

The interior and exterior of all casing pipe shall be cleaned, primed and lined with two coats of asphalt to achieve 0.05-inch minimum coating thickness, in accordance with AASHTO Designation: M190, Type A. All steel casing shall be butt-welded and all welds shall be full penetration single butt-welds in accordance with API Standard 1104.

2.08 INSULATORS FOR PIPE IN CASING

Insulators for supporting pipe installed in casing shall be units designed for such use, constructed of steel, with steel capped plastic, or molded plastic insulating skids in sufficient number to support the carrier pipe when full of water. Insulators shall be CG Series, as manufactured by PSI Products, Inc. or Model SS1 as manufactured by Advance Products and Systems, Inc., or approved equal.

Appropriate risers and insulating runners shall be sufficient to prevent the carrier pipe from resting on the casing and sufficient to prevent flotation for gas mains. The spacing of the insulators shall be as indicated on the drawings.

2.09 STEEL VALVES

- A. General: Steel valves shall be new and manufactured to conform to ASTM A-216, Grade WCB. All steel valves furnished shall be from the same manufacturer. Steel valves shall operate so that the valve will open when turning the operating nut in a counter-clockwise direction. Steel valves buried underground shall have butt weld ends and be factory coated with 11 mils minimum thickness Scotchkote 306 by the 3M Company, Fostercoat, or approved equal. Each steel valve buried underground shall be installed with a high head extension, a non-rising stem with a two-inch square shank adapter wrench nut and cast-iron valve box.

The extension shall bring the operating nut and sealant fittings to within 6" of the ground surface. Furnish the Owner with 1 valve wrench to fit the operating nut furnished. Steel valves, for above ground installations, shall have raised face type flange ends and shall be installed with factory made locking devices. Suitable flanges for attaching above ground valves to pipe shall be furnished. Raised face flanged fittings shall be installed with a full face, neoprene-phenolic faced, type E gasket. The gasket shall fully seal the annular space between fitting faces to eliminate flange corrosion. Unless otherwise specified in the drawings or the Proposal Form, all steel valves shall conform to ANSI Class 150 standards.

After installation, all valves will be furnished with the type and amount for the initial lubrication recommended by the manufacturer for natural gas service.

- B. Valve Requirements:
1. 4" and Smaller Distribution System Steel Valves: Four-inch and smaller aboveground steel valves shall be Flowserve-Nordstrom carbon steel plug valves, figure 1925, wrench operated, or Kerotest gate valves, Model EV-11, wrench operated, or approved equal. Buried valves shall be Flowserve-Nordstrom carbon steel plug valves, figure 1925 ½, wrench operated, or Kerotest gate valves, Model M-1, wrench operated, or approved equal.
 2. 6" Distribution System Steel Valves: Six-inch aboveground steel valves shall be Flowserve-Nordstrom Dynamic Balance plug valves, figure 1945, wrench operated, or Kerotest gate valves, Model EV-11, wrench operated, or approved equal. Buried valves shall be Flowserve-Nordstrom plug valves, figure 4185 ½, wrench operated, or Kerotest gate valves, Model M-1, wrench operated, or approved equal.
 3. Pressure Reducing Assemblies, Regulator Stations, Etc.: Valves for special assemblies shall be as specified on the drawings and shall have a sufficient rating to withstand the maximum line and test pressures.
- C. Valve Flanges: All companion flanges shall be raised face type. Companion flanges for ANSI Class 150 standard valves shall be forged steel slip-on or welding neck conforming to USAS 16.5.

2.10 POLYETHYLENE VALVES

- A. General: Polyethylene (P.E.) valves shall be manufactured to conform to ASTM D-2513 and D-1598. All P.E. valves furnished shall be from the same manufacturer and shall operate so that the valve opens when turning the operating nut in a counter-clockwise

direction. P.E. valves shall be made of cell classification P.E. 345564C, SDR 11 material, and shall be designed for an allowable service pressure of 100 pounds per square inch in a Class 4 location.

Buried P.E. valves shall have a non-rising stem with built-in position indicator - standard 2" square adaptor with deflector cone on top and a valve box made of cast iron collar and plastic bottom. The valves shall have 18" length pipe stub ends which can be butt heat-fused to the pipe or other fittings, and shall be wrench operated.

B. Valve Requirements:

1. 2" Through 8" Distribution System P.E. Valves: Distribution system P.E. valves 2" through 8" shall be Kerotest Polyball, Flowserve-Nordstrom Poly-Gas, Figure No. 85111, or approved equal.
2. Pressure Reducing Assemblies, Regulator Stations, Etc.: Valves for special assemblies shall be as specified on the drawings or on the Bid Form.

2.11 SERVICE ASSEMBLIES

Materials, to complete the various types of service assemblies as detailed on the drawings, shall meet the following specifications:

- A. Service Taps:** Service taps on steel pipe distribution system mains shall be made using a Mueller Welding Inlet No-Blo valve tee #H-17650, Rockford Eclipse, or approved equal.

Service taps on polyethylene pipe distribution system mains shall be made using appropriate sized INNOGAZ tapping tees distributed by Kerotest Manufacturing Corporation or approved equal. The gas service tapping tee shall be joined to the system main by the electrofusion installation method using the appropriate INNOGAZ electrofusion procedures and equipment recommended.

- B. Protective Sleeves:** All P.E. service tap outlets will be fitted with the appropriate protective P.E. sleeve to fit snugly over the pipe-fitting juncture and extend at least 12 inches over the pipe to limit pipe bending and exposure to mechanical damage at the joint.

- C. Curb Stops:** Curb stops shall be 1" size P.E. Kerotest Kerotite Service Valve, Nordstrom Poly-Gas, Figure No. 85111, ball valve, or approved equal, for 1" size service line. For 2", 3", and 4" size P.E. service lines, the curb stop shall be made using the appropriate sized P.E. valve as specified in paragraph 2.09.B of these specifications.

- D. Excess Flow Valve:** Excess flow valves (EFV) shall be Lyco 1" IPS SDR 11, 10" long P.E. pipe stick, Part No. EFVEB-BA7YY00. The EFV shall be required downstream of the curb stop valve on 1" size Type I and/or II service assemblies intended for residential 275 CFH meter settings as shown on the drawings.

- E. Curb Stop Box:** The curb stop box for 2", 3", and 4" size P.E. service lines shall be manufactured the same as for a P.E. valve box, as specified in paragraph 2.10.B of these specifications. For 1" size P.E. service lines only, the curb stop box shall have a minimum inside diameter of 2 inches, and the remaining specifications contained in paragraph 2.10.B shall apply, except the type shall be a Handley Industries Inc. Model G21HA, or approved equal. The bottom of each 1" P.E. valve shall be supported by a 60-pound bag of "Sakrete" concrete mix.

- F. Meter Stops:** Meter stops furnished shall be from the same manufacturer and shall be of the permanently lubricated iron body type. Meter stops on all types of service pipe shall be

Mueller No. H11175, galvanized finish, with lock wing, Rockford Eclipse, or approved equal.

- G. Gas Service Regulators: Gas service regulators shall be aluminum case, aluminum paint by Equimeter, Inc., as specified below, or Fisher S402, and shall meet the following requirements:

<u>MODEL</u>	<u>ORIFICE</u>	<u>INLET PRESSURE</u>	<u>OUTLET PRESSURE</u>	<u>CAPACITY (CF/HR)</u>
#043-182	1/4"	0-3 lbs.	5" - 8 1/2" WC	350
#043-182	1/4"	0-10 lbs.	5" - 8 1/2" WC	700
#143-80-2	1/4"	0-20 lbs.	5" - 8 1/2" WC	1,500
#243-12-2	1/4"	0-25 lbs.	6" - 14" WC	2,400

Low pressure regulators shall be equipped with bug proof inverted vents and internal relief valves. Service regulators #043-182 and #143-80-2 shall be checked to 4-ounce outlet pressure in the field. Large capacity regulators will be as detailed in the drawings.

- H. Gas Service Meters: Meters for gas service shall be aluminum case, aluminum paint by Equimeter, Inc., as specified below, shall have a standard direct reading meter index and shall be capable of accurately measuring 0.6 specific gravity natural gas with pressure losses and capacities as specified below. Capacities indicated are at four (4) ounce base. Large capacity meters will be as detailed in the drawings and/or as called for by the General Requirements. Prior to ordering any new meters, the Contractor shall ascertain from the Owner's Gas Superintendent the new meter numbers to be assigned to each new meter for stamping by the manufacturer.

<u>Type</u>	<u>Meter Size</u>	<u>Water Column Pressure Loss</u>	<u>Size Connection</u>	<u>Max. Capacity (CF/HR)</u>
Equimeter	R-275	1/2"	20 Lt	275
Equimeter	#415	1/2"	20 Lt	415
Equimeter	#750	1/2"	45 Lt	750
Equimeter	#1,600	2"	45 Lt	1,600
Dresser Roots	1M 300		1-1/2"	1,000
Dresser Roots	3M 175		2"	3,000
Dresser Roots	5M 175		3"	5,000

Dresser Roots meters specified shall be the rotary type with side connection.

- I. Insulated Meter Swivels and Flanges: Insulated meter swivels and/or insulating flanges shall be installed as shown on the drawings.
- J. Anodeless Meter: Anodeless meter risers for P.E. service pipe shall be joined to the type service pipe using the method described in paragraph 2.05.B of these specifications for P.E. pipe. Each anodeless meter riser shall be 24" long horizontally and 36" long vertically and shall have a 10" radius bend, as manufactured by GF Central Plastics Company, or Elster Protection Corporation. Anodeless meter riser outlets shall be threaded with male I.P.S. threads to fit existing or new meter stop, regulator or meter fitting.

Pipe size of anodeless meter risers shall be determined by I.P.S. (Iron Pipe Size) of pipe required to fit to the existing or new meter stop, regulator or meter fitting, 3/4" minimum.

- K. Customer Connections: Customer connections shall be installed as shown on the drawings. The pipe size of adaptor, coupling, fittings, etc. shall be determined by the I.P.S. of the pipe required to fit to the existing or new customer piping.
- L. Pipe and Fittings: A minimum of 5 L.F. of the IPS Schedule 40 galvanized steel pipe and

the necessary pipe fittings for service assemblies shall be installed, as shown on the drawings. The pipe size of the steel pipe, meter bars, meter stops, nipples, street ells, couplings, fittings, etc., shall be determined by the IPS required to fit to the existing or new regulator and/or meter fittings, 3/4" minimum.

- M. Floor Valves: The Contractor shall inspect each building or residence with gas utility service to verify the presence of suitable cut-off valves at each gas appliance. New cut-off valves shall be provided where no valves exist or where replacement valves are required for existing defective or inoperable valves. New cut-off valves shall be Rockford-Eclipse bronze gas stops, sized as required, or approved equal. Gas service shall not be restored until suitable floor valves are installed, tested and accepted.
- N. Pressure Gauge: A pressure gauge shall be installed on service assembly set-ups when shown on the drawings. Gauge shall have a 4" dial, shall be glycerin filled and shall have a maximum pressure reading of 2 times the working pressure at the location.
- O. Protective Railings: Protective railings shall be installed for service assembly set-ups when shown on the drawings.

2.12 VALVE BOXES

- A. For Steel Pipe: Valve boxes for welded steel pipe mains shall be made of cast iron and shall be of the heavy roadway type with an inside diameter of not less than 5 inches. The valve boxes shall be adjustable for elevation range of 24" to 36" and shall be of the three-piece screw type. The top of the valve box shall be installed flush with the ground surface or street surface and shall be protected by a 24-inch diameter round or square concrete foundation as shown on the drawings. The valve box cover shall be cast iron with the word "GAS" embossed on the top side and shall be of the bolt-down type.

Valve boxes shall be #H-10360, manufactured by Mueller Co., Decatur, IL 62525, Handley Industries, Inc., or approved equal.

- B. For Polyethylene Pipe: Valve boxes for polyethylene pipe mains shall be made of cast iron collar and plastic bottom and shall be of the heavy roadway type with an inside diameter of not less than 5 inches. The valve boxes shall be adjustable for elevation range of 24" to 36" and shall be of the three-piece slide type. The top of the valve box shall be installed flush with the ground surface or street surface and shall be protected by a 24-inch diameter round or square concrete foundation as shown on the drawings.

The valve box cover shall be cast iron with the word "GAS" embossed on the top side and shall be of the bolt-down type. The valve box shall be manufactured by Handley Industries, Inc., P.O. Box 863, Jackson, Michigan 49204, Mueller Co., or approved equal.

2.13 VENT PIPES AND CROSSING MARKER SIGN

Vent pipes topped with marker signs shall be fabricated as shown on the drawings and be installed by the Contractor as detailed on the drawings for cased crossings. The pipe line crossing marker signs shall be fabricated as shown on the drawings and be installed by the Contractor for other type crossing locations or as directed by the Engineer. Each cased or other type crossing which is required to be marked shall be provided with two vent pipes topped with crossing marker signs or pipe line crossing marker signs, as appropriate.

The crossing marker signs shall be mounted on 2" size Schedule 40 steel pipe welded to the top of the vent pipe, or on rigid flanged, vinyl coated channel type steel posts with drilled or punched 3/8" diameter holes centered at 1" intervals along its entire length. The vinyl coated post shall be impregnated with high intensity green color and ultraviolet inhibitors to resist fading. The post shall

be as distributed by Phillips Engineering Company, Inc., Clearwater, Florida (1-800-446-7326), Handley Industries, Inc. or approved equal.

Under this contract no special payment will be made for furnishing and installation of vent pipes topped with crossing marker signs and/or pipe line crossing marker signs. Cost shall be included in the pipe line crossing bid item, if applicable, or in the unit price bid per foot of gas pipe.

2.14 VALVE WRENCHES

Contractor shall provide the Owner with one (1) each heavy tee handle 2" square socket wrench, Flowserve-Nordstrom Part No. 37213, Mueller Co., or approved equal. Valve wrenches for pressure reducing assemblies, regulator stations, etc. shall be provided as detailed in the drawings or as called for by the General Requirements.

2.15 NON-CORROSIVE METALLIC WIRE OVER P.E. GAS PIPE

Non-corrosive metallic wire shall be installed directly over and on the center of all P.E. gas mains and service lines for detection purposes. This wire shall be continuous on all P.E. mains and service lines and shall be connected to all fixtures, appurtenances and pipe as detailed on the drawings.

The non-corrosive metallic wire shall be Type THHN, A.W.G. #10 gauge, insulated, stranded copper wire. Wire splices shall be made using splice kits similar or equal to Model DBR by 3M.

No special payment shall be made for installation of the wire. The cost of such shall be included in the unit price bid for gas pipe.

2.16 LOCATOR WIRE ANODE

The Contractor shall furnish and install 17-pound anodes connected to the P.E. gas pipe locator wire, as detailed in the drawings. The number of anodes required shall be as detailed in the drawings or as called for by the General Requirements.

All materials shall be new and shall comply with all standards of the cathodic protection industry whether or not these standards are set forth in these drawings and specifications. The Contractor shall furnish a certificate to the Engineer from the supplier that the anode materials conform to these specifications.

- A. Magnesium Anodes: The magnesium anodes shall be Harco Grade III, or approved equal, consisting of the following:

<u>Metal</u>	<u>Percent by Weight</u>
Aluminum	5.3 - 6.7
Manganese	0.15 Min.
Zinc	2.5 - 3.5
Silicon	0.10 Max.
Copper	0.02 Max.
Nickel	0.002 Max.
Iron	0.003 Max.
Others	0.30 Max.
Magnesium	Balance

The anodes shall be vibratory packed in a cotton bag in an artificial backfill consisting of the following:

Hydrated gypsum	75%
Bentonite clay	20%
Sodium Sulfate	5%

- B. Anode Lead Wire: The anode lead wire shall be unspliced Type THHN insulated #10 AWG solid copper wire, same color, not less than 10 feet long. The anode lead wire shall be factory installed with the place of emergence from the anode in a cavity sealed flush with a dielectric sealing compound.

2.17 CORROSION PROTECTION

When indicated on the drawings, the Contractor shall furnish all items necessary to provide the facilities with adequate cathodic protection against corrosion. No direct payment will be made for this work, include all costs in other items of work. The cathodic protection shall have a design life of 20 years and shall be installed in accordance with NACE Publication RP-01-69. The following minimum specifications shall apply:

- A. Anodes and Leads: Each location where cathodic protection is to be installed shall be provided with a 17-pound packaged magnesium anode with a high efficiency backfill material for cathodic protection. The anode and backfill material is to be manufactured by Allied Corrosion Industries, Inc., 6180 Atlantic Blvd., Suite 0, Norcross, Georgia 30071, (800) 241-0809; Harco Corporation, or approved equal.

Each anode shall be provided with a minimum 2-foot-long, unspliced, Type THHN insulated, AWG No. 10 gauge solid copper connecting wire. Each connecting wire shall be factory installed. The location at which the wire emerges from the anode shall be a cavity sealed flush with a dielectric sealing compound.

- B. Lead Bonding: Connection of the anode lead to the facilities shall be by the use of thermal welding equal to Cadweld process. After the connection has been made, inspected and approved, the damaged area of the facilities and the metal portion of the connection shall be thoroughly coated as specified by NACE Specifications RP-02-75.

2.18 SERVICE LINE INSERTIONS

Where indicated on the drawings, the Contractor shall insert new P.E. service line into existing steel service pipe. All new service pipe insertions shall be 0.090" minimum wall thickness CTS P.E. gas service line.

All service line insertions shall maintain an annular space clearance of 10% between the O.D. of the new service line inserted and the existing service line I.D. The size of new service line inserted shall be as follows:

<u>Existing Steel Service Line</u>	<u>New Service Line Insertion (O.D.)</u>
2"	1-1/4"
1-1/2"	1"
1"	3/4"
3/4"	1/2"

Each service line insertion shall be provided with appropriate fittings to allow for meter reconnections to main with and/or without meter relocation.

2.19 CONCRETE

Concrete shall have an average compressive strength of 3500 psi at 28 days. Prior to commencing concrete operations, the Contractor shall furnish for review and approval a mix design indicating the proportions of all ingredients that will be used in the manufacture of the concrete proposed for use. The mix shall contain a minimum of 520 pounds of cement per cubic yard and a maximum of 6.5 gallons of water per bag of cement. Portland cement shall be ASTM C 150, Type I. Portland-Pozzolan cement shall conform to ASTM C 340. The proportion of Portland-Pozzolan cement in the blend shall produce a percentage of Pozzolan not exceeding 20 percent by absolute volume of the total combined volumes of Portland cement and Pozzolan. All water used in the mix shall be potable.

2.20 PAINTING

All steel pipe, valves, and equipment, including service assemblies, protective railings, pressure reducing assemblies, meter/regulator stations, etc., installed above ground shall be painted with an aluminum finish paint.

All steel surfaces shall be solvent and handtool cleaned to SSPC-SP 1 and 2 standards for painting preparation. A primer coat of Pratt-Lambert Tech Guard Rust Inhibitive Primer, or approved equal, at 2.0 mils dry film thickness, shall be applied. A 2 mil DFT finish coat of Pratt-Lambert Tech Guard General Purpose Aluminum Top Coat, or approved equal shall be applied.

Curb stop box covers, valve box covers, terminal box lid and associated pads shall be painted "safety yellow" with a good grade of exterior concrete paint.

No special payment shall be made for painting. Cost will be included in the contract unit price of the item being painted.

PART 3 - EXECUTION

3.01 GENERAL

This part of the work includes installation of gas mains, fittings, valves, valve boxes and appurtenances; excavation and backfill of trenches; cutting and replacing walks and roadway surfacing; and other miscellaneous items necessary to complete and make ready for operation a complete gas distribution system. Contractors' employees performing tasks in connection with the construction of these facilities shall be properly qualified in accordance with DOT requirements and the requirements of the Owner's Operator Qualification Plan.

3.02 COOPERATION WITH UTILITY OFFICIALS

This work will be performed in the close proximity of existing utilities, streets, drainage structures, etc. The Contractor shall at all times cooperate with the various utility and street officials and shall notify the appropriate personnel prior to excavation in areas where known utilities are located.

3.03 CLEARING OF THE RIGHT OF WAY

The Contractor shall clear the right-of-way provided for the main of all objectionable debris and obstructions that will interfere with the installation of the mains. Wooded areas shall be cleared and grubbed and surface obstructions to remain shall be protected in accordance with paragraph 3.06 of these specifications.

3.04 EXCAVATION OF TRENCH AND BACKFILL

Excavations, preparation of trenches, and backfill shall be in accordance with USAS B31.8, except where amended by these specifications. Excavation shall be such that the pipe will have no less than 30 inches of minimum cover (measured from top of trench to top of the barrel of the pipe). Trench bedding and standard backfill shall be as specified for each individual pipe material and detailed on the plan sheets.

3.05 OBSTRUCTION OF TRAVEL

All material shall be placed so as to interfere as little as possible with public travel. At street crossings and other points as directed by the Engineer, trenches shall be bridged in a manner so as to prevent any continuing interruption of public travel; the closure of both sides of a double roadway to vehicular traffic will not be permitted except by special permission. Special care must be taken to give free access at all times to all fire hydrants, water valves, fire alarm boxes and Police Department and Fire Department driveways.

In case the Contractor shall fail to keep open streets, sidewalks, approaches to premises, etc., and shall refuse or neglect to open them within 12 hours after written notification by the Owner; or shall the Contractor fail to afford proper and necessary access to fire hydrants, water valves, fire alarm boxes or Police Department or Fire Department driveways, and shall neglect or refuse to afford such access within one hour of receiving oral or written notice to do so, the Owner shall be and is hereby authorized and empowered to put on such force as may be necessary and to do this work, deducting the actual cost thereof from any money which may be due or may become due the Contractor.

3.06 CONFLICT WITH SURFACE OBSTRUCTIONS

All shade trees, shrubbery, utility poles, etc., within the right-of-way provided shall be protected and any building or structure which may be endangered during the work shall be shored up and otherwise protected. Any properties disturbed or damaged by the Contractor shall be restored to original condition. No additional compensation will be made for corrective work.

3.07 CONFLICT WITH SUBSURFACE OBSTRUCTIONS

The Contractor shall anticipate all underground obstructions such as water lines, gas lines, sewer lines, utility lines, concrete and debris. Any such lines or obstructions indicated on the drawings show only the approximate location and must be verified in the field by the Contractor. Neither the Owner nor the Engineer implies or guarantees the exact location of any existing underground utility; however, the Owner and Engineer will endeavor to familiarize the Contractor with all known underground obstructions.

The Contractor shall take the necessary precautions not to injure any utility mains or service pipes connected therewith or conduits or other underground structures, and the Contractor must repair or have repaired immediately, at his own cost, any public or private structure or pipe damaged by or in the course of his work. Should the Contractor fail to repair or have repaired such damage or injury within a reasonable time, the Owner may after 24 hours written notice, have such repairs made and deduct the cost thereof from any amounts due or to become due the Contractor.

The Contractor shall assume all risks and be responsible for all expenses resulting from attending the presence or proximity of any utility mains, conduits, or other underground structures where such pipes or other structures cross the trench or appear in the trench in such a manner as not to require their rearrangement or realignment. The Contractor's risks and responsibilities shall also apply to such structures as are approximately parallel with or adjacent to but outside of said trench.

The Contractor shall uncover known subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstruction. Should any pipe or other obstruction be determined to interfere with the work the Contractor shall notify the Engineer of the locality and circumstances and the place shall be passed over until satisfactory arrangements are made. Should the obstruction parallel the trench the Engineer may require the Contractor to offset or re-align his pipeline to miss the obstruction. This re-alignment may be made by the use of fittings, pipe deflection and/or valves as the case may dictate.

Where subsurface obstructions cross the trench the Contractor will be permitted to lay pipe above the obstruction if a minimum amount of cover can be maintained while providing a cushion at least 6 inches thick between the bottom of the pipe and the top of the obstruction. Where this minimum cover cannot be obtained the Contractor will be required to lay the pipe under the obstruction and maintain a 6-inch cushion between the top of the pipe and the bottom of the obstruction. Should the location or position of such obstruction within the limits of the trench be such, in the opinion of the Engineer, as to require removal, realignment or change of the obstruction in order that the work may proceed, such removal realignment or change shall be without expense to the Contractor. When, however, such obstruction shall come within the limits of the excavation for the work as located by the Engineer, such pipe, conduit, or other obstruction shall be stripped or uncovered by the Contractor, at his own expense, as constituting a part of his work in excavating.

The Engineer will in all cases render decisions on the necessity or expediency of any change or rearrangement of any underground structures which may interfere with the construction of the work under this contract.

3.08 SPECIAL CROSSINGS

- A. General: Special crossings for which drawings have been made and on which a special price has been asked, will be paid for according to the specifications governing said crossings. Otherwise, no additional compensation will be paid for the construction of any utility line because of its crossing under or over any natural or man-made obstacle provided the route of the gas line as bid has not been changed so as to produce a crossing not anticipated by the bidder.
- B. Permits: The Contractor shall secure the necessary permit from the controlling agency for laying these lines. The permit shall be obtained in the name of the Owner; however, the refundable deposit for the permit shall be made by the Contractor.
- C. Cooperation with Controlling Agency: The Contractor shall submit to the Engineer and the representative of the controlling agency, all details concerning the method of construction and materials and shall have them approved prior to beginning construction.

3.09 HANDLING AND DISPOSAL OF WATER

The Contractor shall pump, bail, or otherwise remove any water which may be found or may accumulate in the excavations, trenches, and shall perform all work necessary to keep them clear of water while the work is in progress. The cost of removing water by pumping or otherwise shall be included in the prices bid for the various items of work; unless a specified bid item is asked for such. The Contractor shall keep his completed work reasonably free of water and shall completely remove all of it for the purpose of installations, inspections and tests.

The Contractor shall prevent any of his work from obstructing any drainage ditch, canal, etc., unless special permission is obtained.

3.10 LOCATION OF EXISTING GAS SYSTEMS

- A. General: The attention of the Contractor is directed to the fact that existing gas mains or

service lines may have to be tapped, cut, temporarily removed from service, relocated, connected and otherwise adjusted to completely perform all required work.

The Contractor will not be permitted to indiscriminately shut off service. The Contractor shall cooperate with the Owner in order that service disruptions will be minimized. The Contractor shall arrange with representatives of the Owner and the Engineer for a mutually acceptable time when service can be discontinued in the various sections of the system. The Contractor shall place a "Gas Cut-Off Notice", furnished by the Owner, on the door of any customer whose gas service is interrupted.

The general location, size and type of existing utilities have been taken from existing maps and/or surveys. The size of pipe indicated is the nominal diameter and the Contractor shall be responsible for obtaining the correct outside diameter of the pipe before ordering any valves, fittings, tapping sleeves, etc., to assure a proper fit.

- B. Locations of Existing Utilities: The approximate locations of known existing utilities has been shown on the drawings and the final location of all tie-ins, taps, etc. shall be approved by the Engineer. The Contractor shall be responsible for physically locating all existing pipe and appurtenances. No additional compensation shall be paid for such work, but shall be included in the unit price bid per foot of pipe.

3.11 INSTALLING STEEL PIPE

All steel gas pipe installations shall be made in accordance with USAS B31.8-841.2, except as amended by these specifications.

The Contractor shall protect all coated pipe from exposure to the weather prior to backfilling. Coated pipe shall be handled at all times with equipment designed to prevent damage to the coating. The Contractor shall not string pipe in excess of the amount which, in the opinion of the Engineer, may not be installed within 7 days.

The use of pinch bars, chain slings, or other pipe handling equipment found to be injurious to the pipe or coating will not be allowed. Sections of coated pipe being tied into the line shall not be dragged or pulled into position, and the length of such sections shall be regulated to allow their handling without damage to the coating. At stream crossings, or at any other locations where it may be necessary to pull, drag, or jack and bore sections of pipe into place, the coated pipe shall be protected as directed by the Engineer.

Type 1 Standard Pipe Foundation as detailed on the plan sheets shall be used for the installation of all steel gas mains, unless otherwise specified on the drawings.

3.12 WELDING AND FIELD COATING PROCEDURE FOR STEEL PIPE

Welding shall be in accordance with USAS B31.8, API Standard 1104, and ASME Section IX, except as modified herein.

- A. Welding Process: Prior to performing any welding, the Contractor's welding shall demonstrate that suitable sound welds can be made by each procedure required. The quality of each weld at every joint shall be determined by mechanical or radiographic testing, as appropriate. Certification of each acceptable written procedure and performance qualification test shall be made by a qualified testing laboratory and the results recorded. Evidence of recent experience making acceptable taps on a pipeline under pressure is also required. A copy of the certification, recorded acceptable test results and hot taps experience shall be given to the Owner and to the Engineer. Retests and renewal of welder performance qualification shall be in accordance with ASME Section IX.

The Contractor shall bear all of the costs associated with qualifying each welding procedure specification, performing each procedure qualification test, recording of the welding data and test results, certifications and retests and renewal of qualification.

The Contractor shall furnish the necessary equipment and personnel to cut out and test welds. For such tests, the entire weld shall be cut from the line, cutting the pipe 4 inches back on each side of the weld. Coupons cut from this weld shall be tested for tensile strength, ductility and penetration. Where welds are cut out for testing, the line shall be tied back together with either a single weld, or by use of a piece of new pipe not less than 2 feet in length.

Pipe shall be butt-welded to develop a joint that will result in complete fusion throughout the entire wall thickness of the pipe. The welded joint shall satisfactorily hold any pressure that the line will be subjected to in testing or during operation at maximum design pressure. At no time shall the pipe be rolled or turned during welding. Any defective joints resulting from poor welding technique, overlaps, under-cuts, convexity, or any other reason shall be cut out and replaced with a satisfactory joint.

Miter joints shall be limited to pipe connections where commercially fabricated welding fittings cannot be used, and then shall be made in segments limiting the deflection in each section to angles agreed upon by the Engineer.

Where welding fittings are required, the welding fittings shall be commercially fabricated ASTM A234 steel fittings of pressure rating equal to or greater than ANSI Class 150 standards. All bends shall be long radius type. Where reduction of size in pipes occur swage fittings shall be used. Ninety-degree saddle welding one pipe into another will not be permitted, except in special cases when prior approval of the Engineer has been obtained.

Each welder shall be furnished a stencil, a record being kept thereof, and each welder shall stencil all welds made by him. The Contractor shall furnish and use only such types and sizes of welding rods as are approved by the Engineer.

- B. Equipment: All pipe shall be electric welded by the "Shielded Metal-Arc" process. Welding machines and appurtenances thereto shall be of size and type suitable for the work, and shall be maintained in such conditions as to insure acceptable welds, continuity of operation, and safety of personnel. Welding machines shall be direct current and shall have reversed polarity, work negative and electrode positive, and shall be operated within the amperage and voltage ranges recommended for each size and type of electrode.
- C. Materials: The filler metal for the shielded metal arc process shall be according to API Standard 1104 and shall be 5/32-inch or 3/16-inch in size.
- D. Procedure Details: Surfaces to be welded shall be free from loose scale, slag, heavy rust, grease, paint, cement and other foreign material except tightly adherent mill scale. A light film of linseed oil primer or spatter film compound may be disregarded. Joint surfaces shall be smooth, uniform and free from fins, tears and other defects which adversely affect proper welding.

The number of filler beads should be such that the completed weld will have a reinforcement of not less than 1/32-inch and not more than 1/16-inch. After the root bead has been completed, the second and third beads shall be added immediately. There shall be not less than three beads. Two beads shall not be started at the same location. The surface pass shall be substantially central to the seam and all surface passes shall be reasonably smooth and free from depressions. The face of the completed weld should be

approximately 1/8-inch greater than the width of the original groove.

The completed weld shall be thoroughly brushed and cleaned. Peening of weld layers or passes may be used to prevent undue distortion. Surface layers and the first pass in groove welds shall not be peened. Peening, when required, shall be performed with light blows of a hammer, using a blunt-nosed tool. Any chipping at the root of welds and chipping of welds to remove defects shall be performed with a round-nosed tool or by gas gouging.

All field welds and test coupons must be clearly marked by stencils to identify the welder and the tests for which the coupons are intended. The Contractor shall keep a record of all symbols and numbers. All welds must present a neat and clean appearance free of cracks, inadequate penetration, burn through or other obvious defects. Undercutting adjacent to the final bead shall not exceed 1/32-inch.

Coupons for all tests may be flame cut from the weld, but all necessary notching and machining of coupons shall be done in the testing laboratory. The use of water for quenching any weld is prohibited.

The Contractor shall, at his expense, cut welds from the line, as directed by the Engineer, for the purpose of testing. After welds are removed from the line, coupons will be cut around the circumference of the pipe and tested as outlined in paragraph 3.12.A above. The Contractor shall bear the cost of replacing defective welds discovered by test or radiographic inspection.

- E. Field Coating of Welded Joints and Repair of Damaged Coating Areas: The field coating procedure for welded steel pipe, fittings, associated appurtenances, and joints installed underground shall be the procedure contained in NAPCA Bulletin 6-69-90-5, and any subsequent revisions thereto, using heat shrinkable materials, such as 3M "Scotchkote" Brand 206P hot melt patch compounds, or Raychem WPCT Thermofit, or approved equal; or a cold-applied coating in 3" wide tapeworm, such as Tapecoat CT, manufactured by the Tapecoat Company, Evanston, Illinois 60204, Grace Servi-Wrap, or approved equal; or the following:

- (1) The pipe and weld shall be cleaned of any scale, dirt or foreign matter. All charred and damaged coating areas shall be abraded by hand filing or use of carborundum cloth.
- (2) A two part, 100% solids, liquid epoxy compound specified by the manufacturer of the coating material shall be applied to the abraded areas. Application shall be made to a minimum thickness of 25 mils and shall overlap undamaged area a minimum of 0.5 inches.
- (3) The liquid patch compounds shall not be applied when the pipe temperature is below 50°F unless provisions are made for heat curing the patch material using methods and temperatures in accordance with the procedures recommended by the coating manufacturer.
- (4) The Contractor shall furnish low-pulse electronic Holiday Detectors of a type approved by the Engineer, and shall check all coating applications with the detector prior to lowering pipe into the trench. All holidays found shall be repaired and such repairs shall again be tested with the detector to make sure the repairs are effective. The Engineer, at his discretion, will inspect both visually and with a Holiday Detector, the coating and repair areas. Any coating showing defects or "Holidays" shall be repaired according to the foregoing specifications for repairing damaged coating areas.

3.13 INSTALLING P.E. PIPE

All P.E. gas mains shall be installed in strict accordance with the manufacturer's recommendation. Each valve on services and mains will be supported by an 80-pound bag of "Sakrete" concrete mix. Heat fused P.E. pipe shall be snaked in the trench. Backfill shall not be placed on any plastic pipe while it is in a heated condition. Cooling of the pipe by an approved method will be required by the Engineer, if necessary. Set time for newly assembled heat fused joints shall be as follows:

10 Minutes minimum @ 60°F to 90°F

11 Minutes minimum @ 40°F to 60°F

12 Minutes minimum @ 25°F to 40°F

3.14 FIELD CUTTING OF PIPE

Field cutting of all pipe shall be accomplished by a method approved by the Engineer. Any section of pipe which is damaged during the cutting operation will be rejected.

3.15 SETTING OF VALVES AND FITTINGS

Setting of valves and fittings shall be in accordance with USAS B31.8, except as modified for P.E. pipe in paragraph 3.13 of these specifications.

3.16 INSTALLING SERVICE ASSEMBLIES

All essential details of construction of the service assemblies to be installed are indicated on the drawings; these drawings shall be followed carefully. The labor, materials and equipment required to be furnished by the Contractor for each service assembly shall depend on the installation size, type and meter setting. The Contractor shall set each service assembly where shown on the drawings or as directed by the Engineer. The drawings will indicate whether the existing meter and/or regulator in the proposed service assembly are to be refitted and used at the relocation point.

Existing meters and regulators, not to be refitted, used again or relocated, shall be delivered to the Owner's Gas Department, accompanied by a "Gas Service Ticket", furnished by the Contractor, detailing the location from which it was removed, old meter number, new meter number, etc. All existing gas service lines which are not to be re-used shall be cut and capped below natural ground surface.

The Contractor shall not set the service assemblies until all the mains have been cleaned, tested, purged and approved by the Engineer.

- A. Service Assembly Type I: Service Assembly Type I as detailed on the drawings shall be for those instances where an existing service assembly with a 275, 415, 750 and/or 1600 cfm meter setting is to be refitted, relocated, and/or replaced.

The Contractor shall disconnect and dismantle the existing service assembly. The Contractor shall furnish the materials as shown on the drawings and install the Owner's existing or new meter and regulator in the service assembly detailed.

Prior to ordering new meters, the Contractor shall ascertain from the Owner's Gas Superintendent the new meter numbers to be assigned to each new meter for stamping by the manufacturer.

The scope of work for "Service Assembly Type I" shall include all the necessary labor,

materials and equipment, field taps, tapping tees, saddles, curb stops, excess flow valves (where required), curb stop boxes, riser, regulator, meter or other incidental devices required to connect the service line to the distribution main; disconnect, refit and/or relocate, reassemble and connect the service assembly to the service line; and connect the customer's piping to the service line.

- B. Service Assembly Type II: Service Assembly Type II as detailed on the drawings shall be for those instances where no service assembly exists. The Contractor shall furnish and install the components, fittings, etc. for the size and type of service assembly set-up as detailed.

The scope of work for "Service Assembly Type II" shall include all the necessary labor, materials and equipment, field taps, tapping tees, saddles, curb stops, excess flow valves (where required), curb stop boxes, or other incidental devices required to connect the service line to the distribution main; and to connect the service assembly set-up to the service line. The meter shall be for a 275 CFH meter setting, except as noted in the drawings, and shall be tagged and delivered to the Owner's Gas Department. The riser alignment device, as manufactured by Gas Products, Inc., P.O. Box 33182, Tulsa, Oklahoma 74153-1183, telephone (800)259-5679, or approved equal, shall be installed in place of the meter.

- C. Service Assembly Type III: Service Assembly Type III as detailed on the drawings shall be for those instances where a designated existing large capacity service assembly with a 2500, 5000 and/or 10,000 CFH meter setting is required to be reconnected, refitted and/or relocated.

The Contractor shall disconnect designated existing large capacity service assemblies. The Contractor shall furnish and assemble the components, fittings, etc. for each proposed large capacity service assembly, as proposed and detailed on the drawings.

The scope of work for "Service Assembly Type III" shall include all the necessary labor, materials and equipment, field taps, tapping tees, saddles, curb stops, curb stop boxes, risers, meters, regulators, pressure gauges, needle valves, concrete blocks with reinforcing for meter supports, adjustable pipe supports, or other incidental devices required to connect the service line to the distribution main; reassemble and relocate (if required) and connect the designated large capacity service assembly to the service line.

3.17 HOT TAP CONNECTIONS OF MAINS

All gas main hot tap connections shall be for those instances where said gas mains to be tapped and/or connected are active and under existing gas system pressure. The Contractor shall furnish the labor, materials (such as all P.E. and steel fittings, transition fittings, weld caps, stopple fittings, three-way tees, etc.) and equipment required for each hot tap connection.

3.18 CAPPING OF EXISTING GAS LINES

Where shown on the drawings, existing cast iron (C.I.), P.E. and steel gas lines shall be cut and capped or cut and double capped. As part of this procedure, the Contractor shall physically remove a length of pipe as indicated in the drawings and as directed by the Engineer. The free ends of the gas line shall be cut in a straight and beveled face after shut off of the gas flow by use of stopple fittings or other means. Caps shall be welded to the P.E. or steel line ends and mechanically jointed to the C.I. line ends with a mechanical joint cap. The steel pipe cap on the existing line that remains in service shall be thoroughly coated as specified in Paragraph 3.12.E of these specifications. The capped ends on the gas lines to be abandoned will not be coated.

3.19 INSTALLING PIPE BY HORIZONTAL DIRECTIONAL DRILLING OR JACKING AND BORING

When shown on the drawings, lines installed under this contract which require crossing under public highways, paved roads, streets, or driveways shall be installed by the horizontal directional drilling (H.D.D.) or the jacking and boring method. The installation of utility pipe by these methods shall be in accordance with A.R.E.A. Specifications.

The excavation of all approach pits and trenches within the right-of-way of the highway or railroad shall be of sufficient length from the street or railroad tracks to permit traffic to pass without interference. All backfill on the approach pits and trenches within the right-of-way shall be tamped in layers a maximum of 6 inches thick for the entire length and depth of the trench or pit. The backfill shall be compacted to 90% of maximum density obtained at optimum moisture as determined by AASHTO T 180-57, Method A. Mechanical tampers may be used after a cover of 6 inches has been obtained over the top of the barrel of the pipe.

The boring operation shall be accomplished using a commercial type drilling or boring rig and the hole made by the installation shall be of the same diameter (within 2 inches) as the largest outside joint diameter of the pipe installed. The pipe shall be installed in the hole immediately after the drill or bore has been made and in no instance shall the hole be left open while unattended.

In the event sub-surface operations result in injury or damage to the pavement, repairs to this pavement shall be made by the Contractor, at no additional cost to the Owner. In the event paving cracks occur on either side of the pipeline, or pavement is otherwise disturbed or broken due to the Contractor's operations, he shall repair or replace the same pavement at his own expense without further compensation.

3.20 INSTALLING CASING PIPE

When shown on the drawings, the Contractor shall furnish and install all utility mains perpendicular to and under railroad tracks and roadways in a casing pipe. This casing shall be complete with end seals, vent pipe, and other specials required to install the main in the casing. All installations shall be in accordance with these Specifications and the requirements of the railroad or roadway, as applicable.

Unless otherwise specified, the casing pipe shall be installed by the H.D.D. or jacking and boring method in conformance with Paragraph 3.19 of these specifications.

3.21 FIELD CLEANING, TESTING AND PURGING

The field cleaning, testing and purging operations shall be applied to the whole or individual valved-off sections of the high pressure distribution mains, distribution mains and service lines either before or after the trench is backfilled, as directed by the Owner. The Contractor shall furnish the equipment, gauges, meter, gas and other material, tools, labor and other necessary assistance for conducting the field cleaning, testing and purging operations.

The Owner shall be notified at least 48 hours in advance of the field cleaning, testing and purging operations. The cleaning, testing and purging of all lines shall conform to the requirements of USAS B31.8, except as modified below:

- A. Cleaning: Prior to conducting the pressure tests, all gas mains, service assembly fittings and/or service lines to be connected thereto shall be blown clear by the use of compressed air and this cleaning operation shall continue until these lines and/or fittings are cleared to the satisfaction of the Owner.

At no time will compressed air be used without a dehumidifier. The lines shall then be pigged with approved foam pigs to demonstrate unrestricted clearance of all 2" size and larger mains.

B. Testing: All gas mains, services and service assemblies shall be tested as follows:

(1) Distribution System Mains and Service Lines:

- (a) Gas mains larger than 3/4" IPS diameter - 100 psi for 24 hours with no pressure loss.
- (b) Piping from the gas main including the service line to the valve on the upstream side of the service assembly, 100 psi for 24 hours with no pressure loss.

(2) Piping from the valve on the upstream side of the service assembly through the service assembly and through the service line to the customer's piping connection - 10" mercury (5 psi) for 15 minutes with no pressure loss.

(3) Any leak developing during any test shall be repaired, the lines and/or fittings made tight and the test repeated until successful.

(4) All tests on the gas mains larger than 3/4" IPS diameter and the service line from the gas main to the valve on the upstream side of the service assembly shall be recorded by a pressure gauge with 10-inch dial and 24-hour charts which will clearly indicate a differential of 1 psi.

C. Radiographical Examinations: All welds made on the steel main feeding each regulator station and the welds on the steel pipe in each regulator station shall be subjected to non-destructive testing. The non-destructive testing shall be by radiographical examination and the radiographical examination procedure shall be in accordance with the latest edition of API Standard 1104. Certified radiographical examination results and the film negatives shall be given to the Owner. The radiographical examination laboratory shall be subject to approval by the Owner.

D. Purging: Prior to delivery of natural gas to the system, all gas mains, service lines, service assemblies and/or the associated fittings shall be purged with natural gas. This is to be performed through the use of the Owner's gas paid for by the Contractor in a manner or procedure as approved by the Owner's Gas Department. At no time shall any valve in the system be subjected to gas pressure on one side and air pressure on the other. Blind flanges shall be used to prevent this condition from occurring.

When gas is delivered to the system, all fittings shall be checked for tightness with a soap-water solution. No gas leaks will be allowed. Results of the tightness tests shall be recorded and a copy given to the Owner. Should the amount of leakage exceed that specified, the Contractor shall, at his expense, locate and repair the defective joints until the leakage is within the specified limits.

3.22 WITNESSING OF TESTS

The cost of witnessing a test shall be borne by the Owner one time. The cost of witnessing re-tests which fail the initial test will be deducted from Contractor payments.

3.23 GAS SERVICE INTERRUPTIONS

Work shall be performed such that gas service will not be interrupted, if possible, throughout this

contract. Whenever it becomes necessary to remove a section of line from service, the Contractor shall cooperate fully with the Owner's Gas Department personnel.

The Contractor and the Owner's Gas Department personnel shall be responsible for checking each house, store, building, etc. in advance to insure that its owner or occupant is or will be available during anticipated gas service interruptions. Prior to refitting and/or relocating the existing service assembly and connecting the service lines to said service assembly and the customer's piping, the Owner's Gas Department personnel will turn off all pilot lights served by said service assembly. After the customer's piping has been reconnected, the Owner's Gas Department personnel will determine that it is safe to turn on the gas, and proceed to re-light all pilot lights served by each service assembly.

The Contractor shall be responsible for coordinating his work with the Owner's Gas Department personnel. Under no circumstances will the Contractor turn on the gas to a customer's piping until it has been determined that it is safe to do so and without the full knowledge of the Owner's Gas Department personnel. The Contractor shall align his work schedule to accommodate the Owner's Gas Department.

3.24 GAS SYSTEM SWITCHOVER

Contractor shall schedule his work such that the switchover from the existing system to the new system shall be at minimum inconvenience to the Owner and its customers. At no time will a new gas main be connected to existing customer until it has been tested and accepted by the Owner. Should the Contractor elect to connect customers to portions of the new system prior to completion of entire system, such connections shall not relieve him of the responsibility of completing his contract as required by the drawings and specifications. Portions so connected or turned over to the Owner will not relieve the Contractor of his responsibilities under the contract until the entire project is completed, tested and accepted.

3.25 PURGING, FLOODING AND ABANDONMENT OF EXISTING GAS LINES

Where noted on the drawings, existing gas lines are to be abandoned. At that time when all services have been transferred to the new mains and all interconnections have been completed, the existing 3" size and smaller gas lines to be abandoned shall be disconnected from their main feed points and purged of gas in the line by cutting and capping, as necessary. The existing 4" size and larger gas lines to be abandoned shall be disconnected from their main feed points, have gas purged from the lines by flooding and filling the lines with water. When all flooding is completed, the 4" size and larger gas lines shall be tightly capped.

No separate payment will be made for abandonment of existing gas lines by the purging and flooding operation. Cost shall be included in the unit price bid per foot of pipe.

3.26 INSTALLING NON-CORROSIVE METALLIC WIRE OVER P.E. GAS PIPE

The Contractor shall install a non-corrosive metallic wire directly over and on the center of all P.E. gas mains and service lines. This wire shall be continuous on all P.E. pipe and shall be connected to all fixtures, appurtenances, and pipe as detailed on the drawings. The wire type shall be as specified in paragraph 2.15.

3.27 INSTALLING LOCATOR WIRE ANODE

The Contractor shall furnish and install 17-pound anodes connected to the P.E. pipe locator wire, as detailed in the drawings. The quantity of anodes required shall be provided as detailed in the drawings or as called for in the General Requirements. The locator wire anode installation shall be as specified in paragraph 2.16. The location of each anode and installation details shall be as shown on the drawings. The anode lead wire connection to the locator wire shall be made using a

3M DBR splice kit. The wire shall be cleaned to bare metal, and the connection made. The packaged magnesium anode shall be placed in an augered hole, as detailed in the drawings. The anode lead wire shall not be used for lowering the anode into the hole. After placing the anode in the hole, the hole shall be filled with earth which is tamped and watered to achieve full compaction.

No special payment will be made for installation of the locator wire anodes. The cost of each shall be included in the unit price bid for P.E. gas pipe.

3.28 SPECIAL BACKFILL

Where shown on the drawings, the Contractor shall furnish and install special backfill. The special backfill shall be red dirt, with a 5 to 15 plastic index which is available in the local area. The degree of compaction shall be as specified in paragraph 3.30.

3.29 SPECIAL FOUNDATION (TYPE 2 STANDARD PIPE FOUNDATION)

Where shown on the drawings, all pipe shall be supported by a special foundation and bedding detailed as Type 2 on the drawings. The special foundation and bedding shall be 4" of washed gravel installed under the pipe. The gravel shall be clean, free from clay, sticks, or other deleterious substances, meeting the following gradation:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
3/4	100
5/8	95-100
No. 4	0-7

3.30 TRENCH BACKFILL AND COMPACTION

- A. Outside Street Surfaces and Shoulders: The backfill in the trench above the pipe shall be placed in layers and compacted to prevent settlement of the trench. Prior to the final acceptance of the pipeline, the trench shall be level with the surrounding natural ground.
- B. Inside Street Surfaces, Other Paved Areas and Street Shoulders: The backfill in the trench above the pipe zone and bedding shall be placed in lifts not to exceed six-inch compacted layers and compacted to 95% of standard density when measured by AASHTO-T99.

The trench shall be compacted for a depth of 2'-0" above the top of the pipe using hand tamps or hand mechanical tamps before the use of a wheel type device or a hydro-hammer is used for compaction purposes.

3.31 REPLACING STREET SURFACING AND SIDEWALKS

In all paved or unimproved streets, the surface of the trenches shall be finished without any needless delay and in the best workmanlike manner with the same kind of roadway or sidewalk improvement that was removed in excavating the trench. The replacement of all street surfaces shall be in accordance with the details shown in the drawings.

Should the Contractor fail or refuse to make such repairs timely, the Owner may after 24 hours written notice, employ such personnel and furnish such materials as may be necessary and do the work, deducting the actual cost thereof from any amounts due or to become due to the Contractor.

The Contractor shall be obligated to maintain and keep in good condition any replacement of base, street surfacing or sidewalks from the time of installation until final acceptance of the work.

3.32 CLEANING UP, REMOVING SURPLUS EARTH, ETC.

As soon as the backfilling of any excavation is completed, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of the filling.

He shall also remove all pipe and other material placed or left on the street or right of way by him except material needed for the replacement of the paving. The street shall be opened and made passable for traffic. Following the above work, the repairing and complete restoration of the street surfaces, bridges, crossings and all places affected by the work shall be done as promptly as possible.

Any surplus earth which may be left on the street or right of way after the excavations have been completely refilled shall be regarded as the property of the Contractor and must be removed as soon as possible at his own expense except that in ungraded streets, it shall be optional with the Engineer whether surplus material shall be removed or deposited on the surface and graded for the convenience of traffic.

PART 4 - METHOD OF MEASUREMENT AND PAYMENT

- 4.01 GAS PIPE:** No separate measurement and payment will be made for gas pipe. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.02 STEEL PIPE FITTINGS:** No separate measurement and payment will be made for steel pipe fittings. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.03 VALVES AND VALVE BOXES:** No separate measurement and payment will be made for valves and valve boxes. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.04 GAS SERVICE ASSEMBLIES:** No separate measurement and payment will be made for gas service assemblies. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.05 FLOOR VALVES:** No separate measurement and payment will be made for floor valves. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.06 GAS SERVICE PIPE:** No separate measurement and payment will be made for gas service pipe. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.07 SPECIAL PIPE FOUNDATIONS:** No separate measurement and payment will be made for special pipe foundations. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.08 SPECIAL BACKFILL:** No separate measurement and payment will be made for special backfill. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.09 REMOVAL AND REPLACEMENT OF HIGHWAY, STREET, DRIVEWAY AND SIDEWALK PAVEMENT AND CURBS:** No separate measurement and payment will be made for removal and replacement of highway, street, driveway, and sidewalk pavement and curbs. All materials and labor associated with this work shall be included in the price bid for associated items of work.

- 4.10 CONCRETE SURFACES TO BE SAWED:** No separate measurement and payment will be made for concrete surfaces to be sawed. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.11 CLEARING AND GRUBBING:** No separate measurement and payment will be made for clearing and grubbing. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.12 REMOVAL AND REPLACEMENT OF CULVERT PIPES:** No separate measurement and payment will be made for removal and replacement of culvert pipes. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.13 HOT TAP CONNECTIONS OF MAINS:** No separate measurement and payment will be made for hot tap connections of mains. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.14 CAPPING OF EXISTING GAS MAINS:** No separate measurement and payment will be made for capping of existing gas mains. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.15 METER/REGULATOR STATION, REGULATOR STATION, OR REGULATOR STATION SCADA AND TELEMETRY REMOTE SYSSYTEM:** No separate measurement and payment will be made for meter/regulator station, regulator station, or regulator station scada and telemetry remote system. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.16 SPECIAL LUMP SUM – RAILROAD CROSSINGS, ROADWAY CROSSINGS, CANAL CROSSINGS AND LEVEE CROSSINGS, ETC.:** No separate measurement and payment will be made for special lump sum – railroad crossings, roadway crossings, canal crossings, and levee crossings, etc. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.17 SPECIAL LUMP SUM – GAS SEPARATOR WITH CONCRETE VAULT:** No separate measurement and payment will be made for special lump sum – gas separator with concrete vault. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.18 ITEMS TO BE FURNISHED TO THE OWNER:** No separate measurement and payment will be made for items to be furnished to the owner. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.19 FIELD CLEANING, TESTING AND PURGING OF GAS MAINS:** No separate measurement and payment will be made for field cleaning, testing, and purging of gas mains. All materials and labor associated with this work shall be included in the price bid for associated items of work.
- 4.20 CLEANUP, MAINTENANCE AND FINAL RESTORATION:** No separate measurement and payment will be made for cleanup, maintenance and final restoration. All materials and labor associated with this work shall be included in the price bid for associated items of work.

END OF SECTION 02555

**SECTION 02900
SODDING**

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions, apply to this Section.
- B. Refer to earthwork specifications for additional requirements that relate to this work.

1.2 DESCRIPTION OF WORK

- A. This work consists of furnishing, hauling, planting, rolling, watering, fertilizing and maintaining live grass sod at locations shown on the plans or as directed by the Engineer.

PART 2 -PRODUCTS

2.1 MATERIALS

- A. Approved slab sod shall be either field grown grass or nursery grown grass.
- B. Grass sod shall be Centipede, St. Augustine, Bermuda Grass, Carpet Grass, or other approved grass native to the sodded area.
- C. Sod shall be free from noxious weeds or other vegetation.
- D. Water may be obtained from any source. Brackish water, sewage water, chemically contaminated or oily water shall not be used.

2.2 FERTILIZER

- A. Fertilizer shall be a commercial grade, uniform in composition, free-flowing, and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled. Where fertilizer is furnished from bulk storage, the contractor shall furnish a supplier's certification of analysis and weight. Fertilizer application shall be at the following rates:

<u>Type</u>	<u>Pounds/Acre</u>
8-8-8	1000
12-12-12	667
13-13-13	615
16-16-16	500

2.3 AGRICULTURAL LIME

- A. If required by the plans or General Requirements, agricultural lime shall consist of ground limestone containing at least 90% calcium carbonate equivalent (CaCO₃). The material shall be ground so that a minimum of 90% passes a No. 10 sieve and 25% passes a No. 100 sieve. Agricultural lime shall be applied at the rate of 2000 lbs/acre.

PART 3 -EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

- A. Slab soil shall be cut with approved sod cutters. The designated area shall be mowed when necessary. Sod shall be cut to a minimum soil depth of one and one-half inches (1-½") for field-grown grass and one inch (1") for nursery grown grass, and to a uniform width and in convenient lengths for handling. Soil shall be retained on roots of sod during excavating, hauling and planting. Slab sod shall match, as close as possible, the type of adjacent grass cover of the area receiving slab sod. If the type of adjacent grass cover cannot be determined, St. Augustine sod will be the type of slab sod used.

3.2 HANDLING SOD

- A. Sod shall be placed flat, grass side up in pallets containing no more than 50 square yards of sod and hauled covered, to the planting site with soil intact. Pallets shall be off-loaded and placed as close as practical to the planting site.

3.3 PLANTING

- A. Areas to receive slab sod shall be pulverized to a depth of at least three inches (3"), graded and cleared of weeds, grass, stones and other debris. If an item for agricultural lime is included in the contract, liming shall be done when the area is being pulverized. Fertilizer shall be applied in accordance with the type and rates as indicated in Section 39 92 10 Broadcast Seeding. Approximately ninety percent (90%) of the fertilizer shall be broadcast over the area to receive slab sodding, and the remaining ten percent (10%) shall be broadcast over sod after placing and rolling. Upon delivery to the planting site, slab sod shall be transferred onto the surface soil. Areas to be added shall be watered as directed. Sod shall be placed with minimum space between slabs. Slabs shall be staggered such as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas, the offset of individual strips shall not exceed 6 inches. Slabs, which do not fit closely shall be pulled together by hand or with suitable tools and pegged when necessary. Topsoil shall be used to fill any unavoidable gaps in the sod.

3.4 ROLLING

- A. Slab sod shall be rolled after planting with smooth drum steel wheel rollers or cultipackers. Where rolling is impractical, sod shall be tamped by approved hand methods.

3.5 WATERING

- A. Slab sodding shall be watered by the Contractor until the root system is established or as required to ensure a healthy stand of grass. Slab sod areas shall be kept moist for a minimum of 30 days after sodding.

END OF SECTION 02900

**SECTION 03300
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

- 1.01 DESCRIPTION:** This item specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

Cast-in-place concrete (if shown on the Drawings) includes the following:

- A. Foundations, grade beams, footing and spread footings.
- B. Slabs-on-grade.
- C. Fill for steel deck.
- D. Foundation walls.
- E. Building frame members.
- F. Equipment pads and bases.
- G. Fill for steel pan stairs.
- H. Thrust blocking.

1.02 RELATED WORK

- A. 02300 Excavation and Backfill for Buildings

1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings
- B. ACI 304.3R - Heavyweight Concrete: Measuring, Mixing, Transporting and Placing
- C. ACI 305.1 - Specification for Hot Weather Concreting
- D. ACI 306.1 - Standard Specification for Cold Weather Concreting
- E. ACI 309.1 - Report on Behavior of Fresh Concrete During Vibration
- F. ACI 315 - Details and Detailing of Concrete Reinforcement
- G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary
- H. ACI 347 - Guide to Formwork for Concrete
- I. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
- J. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
- K. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- L. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
- M. ASTM C33 - Standard Specification for Concrete Aggregates
- N. ASTM C39 - Standard Specification for Lightweight Aggregates for Structural Concrete
- O. ASTM C94 - Standard Specification for Ready-Mixed Concrete
- P. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
- Q. ASTM C150 - Standard Specification for Portland Cement
- R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
- S. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete
- T. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- U. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete
- V. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- W. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete
- X. ASTM C416 - Standard Classification of Silica Refractory Brick
- Y. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete
- Z. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- AA. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers
- BB. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

- CC.** Concrete Reinforcing Steel Institute - Manual of Standard Practice
- DD.** Concrete Reinforcing Steel Institute - Placing Reinforcing Bars

PART 2 - MATERIALS

2.01 FORM MATERIALS

- A. FORMS FOR EXPOSED FINISH CONCRETE:** Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on drawings.
 - 1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class 1, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. FORMS FOR UNEXPOSED FINISH CONCRETE:** Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. FORMS FOR CYLINDRICAL COLUMNS AND SUPPORTS:** Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- D. FORM RELEASE AGENT:** Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. FORM TIES:** Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1 1/2 inches to the plane of the exposed concrete surface.
 - 1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.02 REINFORCING MATERIALS

- A. REINFORCING BARS:** ASTM A615, Grade 60, deformed.
- B. STEEL WIRE:** ASTM A82, plain, cold-drawn steel.
- C. WELDED WIRE FABRIC:** ASTM A185, welded steel wire fabric.
- D. SUPPORTS FOR REINFORCEMENT:** Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI "Placing Reinforcing Bars".
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.03 CONCRETE MATERIALS

- A. PORTLAND CEMENT:** ASTM C150, Type I.
 - 1. Use one brand of cement throughout Project unless approved by Engineer.
- B. FLY ASH:** Will be allowed with a 20% by weight maximum proportion.
- C. NORMAL-WEIGHT AGGREGATES:** ASTM C33 and as specified. Provide aggregates from a single source for exposed concrete.

1. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
 2. Local aggregates not complying with ASTM C33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when approved by Engineer.
- D. LIGHTWEIGHT AGGREGATE:** If shown on Drawings, use ASTM C330.
- E. WATER:** Potable.
- F. ADMIXTURES**
1. **GENERAL:** Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
 2. **AIR-ENTRAINING ADMIXTURE:** ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 3. **WATER-REDUCING ADMIXTURE:** ASTM C494, Type A.
 4. **HIGH-RANGE WATER-REDUCING ADMIXTURE:** ASTM C494, Type F or Type G.
 5. **WATER-REDUCING, ACCELERATING ADMIXTURE:** ASTM C494, Type E.
 6. **WATER-REDUCING, RETARDING ADMIXTURE:** ASTM C494, Type D.
- G. CAPILLARY BARRIER:** Under all interior slabs on grade, use 4" layer of clean flume sand, whether shown on the drawings or not.
- H. VAPOR RETARDER:** Provide vapor retarder that is resistant to deterioration when tested according to ASTM E1745, as follows:
1. Plastic sheet not less than 10 mils thick.
- I. MOISTURE-RETAINING COVER:** One of the following, complying with ASTM C171.
1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene-coated burlap.
- J. LIQUID MEMBRANE-FORMING CURING COMPOUND:** Liquid-type membrane-forming curing compound complying with ASTM C309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal. Use Type 1-D on exterior concrete pavements and walks.
1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/l.

PART 3 - EXECUTION

- 3.01 GENERAL:** Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.
- 3.02 SUBMITTALS:** Submit the following documents:
- A.** Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Engineer.
 - B.** Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

- C. Samples of materials as requested by Engineer, including names, sources, and descriptions, as follows.
- D. Laboratory test reports for concrete materials and mix design test.
- E. Material certificates in lieu of material laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

3.03 QUALITY ASSURANCE

- A. **CODES AND STANDARDS:** Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. **CONCRETE TESTING SERVICE:** Engage a testing agency acceptable to Engineer to perform material evaluation tests and to design concrete mixes.

Materials and installed Work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

3.04 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.
 - 1. Do not use the same testing agency for field quality control testing.
- B. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 calendar days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Engineer.
- C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:
 - 1. Concrete for foundations and slabs-on-grade shall be 3500 psi, 28-day compressive strength normal weight. Water-cement ratio 0.50 maximum (non air-entrained), 0.45 maximum (air-entrained). Minimum cement factor = 520 lbs./c.y. Water reducing admixture is required.
 - 2. Concrete on steel decks and/or stair landings or steps shall be 4000 psi, 28-day compressive strength lightweight concrete. Water-cement ratio shall be as required by vendor. Water reducing admixture is required.
 - 3. If shown on Drawings, concrete grout for CMU pier, bond beam, and lintel fill shall be 2500-psi, 28-day compressive strength conforming to ASTM C 416 standard specification. Design mixture to be 1/2, 1/2, 1 1/2 (Portland cement, sand, pea gravel) with 9" design slump and 3/8" maximum size pea gravel.
 - 4. All other concrete shall be 3500 psi, 28-day compressive strength normal weight. Minimum cement factor = 520 lbs./c.y. (non air-entrained).
- D. **SLUMP LIMITS:** Proportion and design mixes to result in concrete slump at point of placement as follows:
 - 1. Ramps, slabs, and sloping surfaces: Not more than 4 inches.
 - 2. Concrete Footing Shafts: Slump range of 5 to 8 inches.

3. Grade Beams: Slump range 3 to 5 inches.
4. Slabs and Pavements on Grade: Maximum slump 5 inches.
5. Concrete grout for CMU pier, bond beam, and Lintel Fill-Slump range 7 to 9 inches.
6. Concrete containing high-range water-reducing admixture (super-plasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete.
7. Other concrete: Not more than 4 inches.

E. ADJUSTMENT TO CONCRETE MIXES: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in Work.

3.05 ADMIXTURES

- A.** Use water-reducing admixture in all 3500 psi concrete.
- B.** Use high-range water-reducing admixture (super-plasticizer) in concrete, as required, for placement and workability.
- C.** Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).
- D.** Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 5% with a tolerance of plus or minus 1 1/2 percent.
- E.** Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

3.06 CONCRETE MIXING

- A. READY-MIXED CONCRETE:** Comply with requirements of ASTM C94, and as specified.
 1. When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 1 1/2 hours to 75 minutes, and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

3.07 FORMS

- A. GENERAL:** Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits.

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

- B. CONSTRUCTION:** Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place

concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

- C. **PROVISIONS FOR OTHER TRADES:** Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- D. **CLEANING AND TIGHTENING:** Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.08 VAPOR RETARDER/BARRIER INSTALLATION

- A. **GENERAL:** Place vapor retarder/barrier sheeting in position with longest dimension parallel with direction of pour.
- B. **JOINTS:** Lap joints 6 inches and seal with manufacturer's recommended mastic or pressure-sensitive tape.

3.09 PLACING REINFORCEMENT

- A. **GENERAL:** Comply with CRSI "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as specified.
 - 1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
 - 2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
 - 3. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Engineer.
 - 4. Place reinforcement to maintain minimum coverage as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.10 JOINTS

- A. **CONSTRUCTION JOINTS:** Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Engineer.
- B. **KEYWAYS:** Provide keyways at least 1 1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. **CONSTRUCTION JOINTS:** Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

- D. BONDING AGENT:** Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. WATERSTOPS:** Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of Work. Field fabricate joints in waterstops according to manufacturer's printed instructions.
- F. ISOLATION JOINTS IN SLABS-ON-GRADE:** Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- G. CONTRACTION (CONTROL) JOINTS IN SLABS-ON-GRADE:** Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, unless otherwise indicated.
 - 1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab cured, remove inserts and clean groove of loose debris.
 - 2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 - 3. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and locate to conform to bay spacing wherever possible (at column centerlines, at half bays, third bays).
 - 4. Joint fillers and sealants shall be as specified on plans.

3.11 INSTALLING EMBEDDED ITEMS

- A. GENERAL:** Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. FORMS FOR SLABS:** Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.12 PREPARING FORM SURFACES

- A. GENERAL:** Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. APPLICATION:** Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

3.13 CONCRETE PLACEMENT

- A. INSPECTION:** Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. GENERAL:** Comply with ACI 304.3R and as specified.
- C. DEPOSIT OF CONCRETE:** Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

- D. PLACING CONCRETE IN FORMS:** Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.1.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators 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 set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. PLACING CONCRETE SLABS:** Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.
- F. COLD-WEATHER PLACEMENT:** Comply with provisions of ACI 306.1 and as follows:
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 2. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C) and not more than 80 degrees F (27 degrees C) at point of placement.
 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 accepted in mix designs.
- G. HOT-WEATHER PLACEMENT:** When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305.1 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F (32 degrees C). Mixing water may be chilled 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. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.

3.14 FINISHING FORMED SURFACES

- A. **ROUGH-FORMED FINISH:** Provide a rough- formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. **SMOOTH-FORMED FINISH:** Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. **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.

3.15 MONOLITHIC SLAB FINISHES

- A. **SCRATCH FINISH:** Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
 - 1. After placing slabs, finish surface to tolerances of F (F) 15 (floor flatness) and F (L) 13 (floor levelness) measured according to ASTM E1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. **FLOAT FINISH:** Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F (F) 18 (floor flatness) and F (L) 15 (floor levelness) measured according to ASTM E1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. **TROWEL FINISH:** Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
 - 1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F (F) 20 (floor flatness) and F (L) 17 (floor levelness) measured according to ASTM E1155. Grind smooth any surface defects that would telegraph through applied floor covering system.
- D. **TROWEL AND FINE BROOM FINISH:** Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.

- E. NONSLIP BROOM FINISH:** Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.16 MISCELLANEOUS CONCRETE ITEMS

- A. FILLING IN:** Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, 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 shown or required to complete 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 to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.17 CONCRETE CURING AND PROTECTION

- A. GENERAL:** Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. INITIAL CURING:** Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. CURING METHODS:** Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
1. **MOISTURE CURING:** Provide moisture curing by the following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Use continuous water-fog spray.
 - c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
 2. **MOISTURE-RETAINING CURING:** Provide moisture-retaining cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- D. CURING COMPOUND:** Apply curing compound on exposed interior slabs and exterior slabs, walks, and curbs as follows:
1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3

hours after initial application. Maintain continuity of coating and repair damage during curing period.

2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

E. CURING FORMED SURFACES: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

F. CURING UNFORMED SURFACES: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.18 REMOVING FORMS

A. FORMWORK NOT SUPPORTING WEIGHT OF CONCRETE: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. FORMWORK SUPPORTING WEIGHT OF CONCRETE: Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. FORM-FACING MATERIAL: Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.19 REUSING FORMS

A. 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-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Engineer.

3.20 CONCRETE SURFACE REPAIRS

A. PATCHING DEFECTIVE AREAS: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Engineer.

B. PATCHING PROCEDURE: Mix dry-pack mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than one inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color.

Provide test areas 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.

C. REPAIRING FORMED SURFACES: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. REPAIRING UNFORMED SURFACES: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces 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. Proprietary underlayment compounds may be used when acceptable to Engineer.
4. Repair defective areas, except random cracks and single holes not exceeding one inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

3.21 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. SAMPLING AND TESTING: Sampling and testing for quality control during concrete placement may include the following, as directed by Engineer.

1. **SAMPLING FRESH CONCRETE:** ASTM C172, except modified for slump to comply with ASTM C94.
 - a. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - b. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
 - c. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 degrees F (4 degrees C) and below, when 80 degrees F (27 degrees C) and above, and one test for each set of compressive-strength specimens.

- d. Compression Test Specimen: ASTM C31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
 - e. Compressive-Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
- 2. **FREQUENCY OF TESTING:** When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. **COMPARISON BETWEEN FIELD-CURED CYLINDERS AND COMPANION LABORATORY-CURED CYLINDERS REQUIREMENT:** When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - 4. **STRENGTH LEVEL REQUIREMENT:** Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- B. **SAMPLING TEST RESULTS:** Test results shall be reported in writing to Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
 - C. **NON-DESTRUCTIVE TESTING:** Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
 - D. **ADDITIONAL TESTS:** The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

PART 4 - MEASUREMENT AND PAYMENT

4.01 CAST-IN-PLACE CONCRETE MEASURED AS PART OF ANOTHER BID ITEM:

No measurement will be made for cast-in-place concrete; include this work in other items.

END OF SECTION 03300

**SECTION 03301
CONCRETE FOR GENERAL CONSTRUCTION**

PART 1 - GENERAL

- 1.01 DESCRIPTION:** This item specifies general (non-structural) concrete used in the project, except for special concrete which may be identified in the General Requirements. Unless otherwise noted in the General Requirements, in other sections of these specifications, or on the drawings, all concrete shall be Class A as hereinafter defined. Full cooperation shall be given other trades to install embedded items. Suitable templates or instructions will be provided for setting items not placed in the forms. Before placing concrete, embedded items shall have been inspected, and tests for concrete or other materials or for mechanical operations shall have been completed and approved. General concrete includes the following:

1. Incidental Paving
2. Minor Structures
3. Sidewalks
4. Streets
5. Curbs and Gutters
6. Thrust blocking

1.02 RELATED WORK

- 1.03 REFERENCES:** Generally, Portland cement concrete shall conform to the requirements of the Portland Cement Association's Specifications for Plain and Reinforced Concrete, latest revisions. Other publications (latest revisions), listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references:

A. American Association of State Highways Officials (AASHTO), Standard:

1. M 73 Cotton Mats for Curing Concrete.
2. M 148 Liquid Membrane Forming Compounds.

B. American Concrete Institute (ACI), Standards:

1. ACI 305.1 Specification for Hot Weather Concreting
2. ACI 306.1 Standard Specification for Cold Weather Concreting
3. ACI 315 Details and Detailing of Concrete Reinforcement
4. ACI 318 Building Code Requirements for Structural Concrete and Commentary
5. ACI 347 Guide to Formwork for Concrete

C. American Society for Testing and Materials (ASTM), Publications:

1. A 185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
2. A 615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. A 996 Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
4. C 33 Standard Specification for Concrete Aggregates
5. C 78 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
6. C 94 Standard Specification for Ready-Mixed Concrete
7. C 143 Standard Test Method for Slump of Hydraulic-Cement Concrete
8. C 150 Standard Specification for Portland Cement
9. C 171 Standard Specification for Sheet Materials for Curing Concrete
10. C 173 Standard Test Method for Air Content of Concrete by Volume Method
11. C 192 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

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| 12. | C 330 | Standard Specification for Lightweight Aggregates for Structural Concrete |
| 13. | C 231 | Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method |
| 14. | C 260 | Standard Specification for Air-Entraining Admixtures for Concrete |
| 15. | C 330 | Standard Specification for Lightweight Aggregates for Structural Concrete |
| 16. | C 464 | Standard Specification for Chemical Admixtures for Concrete |
| 17. | C 595 | Standard Practice for Blended Concrete Cements |
| 18. | D 98 | Standard Specification for Calcium Chloride |
| 19. | E 11 | Standard Specification for Wire-Cloth and Sieves for Testing Purposes |

PART 2 - MATERIALS

- 2.01 ABRASIVE AGGREGATE:** shall consist of not less than 55 percent aluminum oxide or silicon-carbide abrasive ceramically bonded together to form a homogenous material sufficiently porous to provide a good bond with Portland Cement paste or shall be crushed, factory-graded emery aggregate, cubical or polyhedral in form, consisting of not less than 25 percent ferric oxide. The aggregate shall not be affected by freezing, moisture, or cleaning compounds. The aggregate shall be well graded in size from particles retained on the No. 30 sieve to particles passing the No. 8 sieve designated by ASTM E 11.
- 2.02 ADMIXTURES:** Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- A. AIR-ENTRAINING ADMIXTURE:** ASTM C-260
 - B. ACCELERATING AGENT:** Calcium chloride conforming to ASTM D 98, Type 1 or Type 2. Use and amount shall be subject to approval.
 - C. OTHER ADMIXTURE:** Admixture other than air-entraining agent and accelerating agent shall conform to ASTM C 494 and shall be compatible with the mix at job temperatures. Other admixture may be used in establishing the design mix. Other admixture may be used on written approval when required by the concrete placing and finishing conditions; however, reduction of the cement content will not be permitted.
 - D. WATER-REDUCING ADMIXTURE:** ASTM C494, Type A.
 - E. HIGH-RANGE WATER-REDUCING ADMIXTURE:** ASTM C494, Type F or Type G.
 - F. WATER-REDUCING, ACCELERATING ADMIXTURE:** ASTM C494, Type E.
 - G. WATER-REDUCING, RETARDING ADMIXTURE:** ASTM C494, Type D.
- 2.03 AGGREGATES:** ASTM C 33. Coarse aggregate shall be well graded from fine to coarse within the prescribed limits. Maximum nominal coarse aggregate size shall be 1 1/2 inches for concrete work 5 inches or more in thickness and 1 inch for concrete work 4 inches thick, or less, except that aggregates shall not be larger than three-fourths the minimum clear spacing between reinforcing steel, or between reinforcing steel and forms.
- A.** Provide aggregates from a single source for exposed concrete.
 - B.** For exposed exterior surfaces, fine or coarse aggregates shall not contain substances that cause spalling.
 - C.** Local aggregates not complying with ASTM C33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Engineer.
- 2.04 FLY ASH:** Will be allowed with a 20% by weight maximum proportion.
- 2.05 CAPILLARY BARRIER:** Under all interior slabs on grade, use 4" layer of clean flume sand, whether shown on the drawings or not.

- 2.06 VAPOR RETARDER:** Provide vapor retarder that is resistant to deterioration when tested according to ASTM E1745, as follows:
- A.** Plastic sheet not less than 10 mils thick.
- 2.07 CEMENT:** Only one brand of any one type of cement shall be used for exposed concrete surfaces of any individual structure. In determining the approved mix, Portland Cement or Portland-pozzolan cement may be used with Portland cement as a blend. The proportions of natural cement in the blend shall not exceed by 25 percent by volume of the total cement used in the mixture. The proportion of Portland-pozzolan cement in the blend shall produce a percentage of pozzolan not exceeding 20 percent by absolute volume of the total combined volumes of Portland cement and pozzolan.
- A. PORTLAND CEMENT:** ASTM C 150, Type I, unless otherwise specified
 - B. HIGH-EARLY-STRENGTH PORTLAND CEMENT:** ASTM C 150
 - C. PORTLAND-POZZOLAN CEMENT:** ASTM C 340
- 2.08 CURING MATERIALS:** Liquid membrane forming compounds shall conform to AASHTO M 148 and shall be listed on the LaDOTD list of approved products. Compound shall be Type 2 white pigmented.
- 2.09 REINFORCEMENT:**
- A. BARS:** Deformed, conforming to one of the following: ASTM A 615, grade 60,
 - B. WELDED WIRE FABRIC:** ASTM A185, welded steel wire fabric.
 - C. TIE BARS:** Deformed steel bars conforming to ASTM A 615, grade 60.
- 2.10 SUPPORTS FOR REINFORCEMENT:** Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI "Placing Reinforcing Bars".
- 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).
- 2.11 WATER:** shall be potable.
- 2.12 STORAGE OF MATERIALS:** Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Liquid admixtures shall be protected from freezing and from settling out of solution. Any deteriorated or damaged materials shall not be used for concrete.
- 2.13 FORM MATERIALS**
- A. FORMS FOR EXPOSED FINISH CONCRETE:** Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class 1, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
 - B. FORMS FOR UNEXPOSED FINISH CONCRETE:** Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. FORMS FOR CYLINDRICAL COLUMNS AND SUPPORTS:** Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
 - D. FORM RELEASE AGENT:** Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - E. FORM TIES:** Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1 1/2 inches to the plane of the exposed concrete surface. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.
- 2.14 MOISTURE-RETAINING COVER:** One of the following, complying with ASTM C171.
- A.** Waterproof paper.
 - B.** Polyethylene film.
 - C.** Polyethylene-coated burlap.
- 2.15 LIQUID MEMBRANE-FORMING CURING COMPOUND:** Liquid-type membrane-forming curing compound complying with ASTM C309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal. Use Type 1-D on exterior concrete pavements and walks.
- Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/l.

PART 3 - EXECUTION

- 3.01 GENERAL:** Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel. Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Liquid admixtures shall be protected from freezing and from settling out of solution. Any deteriorated or damaged materials shall not be used for concrete.
- 3.02 ESTABLISHED DESIGN-MIX PROPORTIONS:** Prior to commencing operations, the Contractor shall furnish a statement giving the mix proportions of all ingredients, maximum nominal coarse-aggregate size, that will be used in the manufacture of the class of concrete proposed for use. Proportions shall indicate weight of dry cement and weights of aggregates in saturated surface-dry condition. The statement shall be accompanied by test reports and all test results from an independent commercial testing laboratory, attesting that the proportions thus selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.
- 3.03 ADMIXTURES**
- A.** Use water-reducing admixture in all 3000 psi concrete.
 - B.** Use high-range water-reducing admixture (super-plasticizer) in concrete, as required, for placement and workability.
 - C.** Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).
 - D.** Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 5% with a tolerance of plus or minus 1 1/2 percent.
 - E.** Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

- 3.04 READY-MIXED CONCRETE:** Comply with requirements of ASTM C94, and as specified. When air temperature is between 85°F (30° C) and 90° F (32° C), reduce mixing and delivery time from 1 1/2 hours to 75 minutes, and when air temperature is above 90° F (32° C), reduce mixing and delivery time to 60 minutes.
- 3.05 PROPORTIONING OF CONCRETE MIXES:** Trial design batches and testing to meet requirements of the class of concrete specified shall be the responsibility of the Contractor. The design mix shall contain aggregates representative of those proposed for use in the work and shall be of consistencies specified herein. Tests for slump, unit weight, and air content shall be performed in the field, witnessed by the Engineer or his representative.
- 3.06 CONCRETE FIELD TESTS:** All materials to be tested and equipment necessary for taking samples shall be provided by the Contractor. Five 6 inch by 12 inch concrete cylinders shall be molded for each lot. A lot shall be defined as 50 cubic yards or each day's pour if less than 50 cubic yards. After 24 hours, the cylinders will be delivered to the testing laboratory for curing and testing. Two of the cylinders shall be tested at 7 days and three at 28 days. For acceptance and payment purposes, the compressive strength of the lot shall be the average compressive strength of the three specimens tested at 28 days. When the compressive strength of any individual specimen in a set of three is more than 15 percent above or below the average strength for a set, that specimen shall be considered an outlier and discarded and the strengths of the remaining cylinders shall be averaged to determine the strength of the set.
- If the compressive strength of the lot is below the required compressive strength, the concrete in the lot shall be removed and replaced at the contractor's expense.
- 3.07 REINFORCEMENT:** shall be fabricated to shapes and dimensions shown and shall be placed where indicated. Reinforcement shall be free of loose or flaky rust and mill scale, or coating, including ice, and any other substance that would reduce or destroy the bond. Reinforcing steel reduced in section shall not be used. After any substantial delay in the work previously placed reinforcing steel left for future bonding shall be inspected and cleaned. Reinforcing steel shall not be bent or straightened in a manner injurious to the steel or concrete. Bars with kinks or bends not shown on drawings shall not be placed. The use of heat to bend or straighten reinforcing steel will be permitted only if the entire operation is approved. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter, the resulting arrangement of bars including additional bars necessary to meet structural requirements shall be approved by the Engineer before concrete is placed. Reinforcing steel shall not be spliced at points of maximum stress unless otherwise indicated. Laps or splices shall be made in conformance with ACI 318. Exposed reinforcement bars, inserts, and plates intended for bonding with future extensions shall be protected from corrosion.
- 3.08 REINFORCEMENT DETAILING AND PLACEMENT, INCLUDING CONCRETE PROTECTION FOR STEEL REINFORCEMENT:** unless otherwise indicated, shall conform to ACI 315 and 318.
- 3.09 TIE BARS:** shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete.
- 3.10 CLASSES OF CONCRETE, AND USAGE:** Concrete of the various classes and composition shall be in accordance with the following table, unless otherwise stated on the plans or in the General Requirements.

<u>CLASS</u>	AVERAGE COMPRESSIVE STRENGTH @ 28 DAYS <u>psi</u>	MINIMUM CEMENT CONTENT/C.Y. <u>lbs.</u>	MAXIMUM WATER CONTENT/BAG CEMENT <u>Gallons</u>
AA	4,000	564	6.0
A	3,500	520	6.5
B	3,000	470	6.5
C	2,500	423	7.0
D	2,000	376	8.0

The compositions shown in the table are for non-air entrained concrete. When air-entrainment is required, composition shall be adjusted accordingly, in accordance with the recommendations of the Portland Cement Association publication (latest revision) "Design and Control of Concrete Mixtures", subject to the approval of the Engineer.

The compositions shown are generally based on one (1") inch size (maximum) coarse aggregate. When required by the plans, other sections of the specifications, the General Requirements, or to meet the requirements of this section, the maximum size of coarse aggregate permissible may result in appropriate changes to the limits shown. Any such changes will be made without additional compensation to the Contractor.

The class of concrete required shall be Class A unless otherwise indicated.

3.11 SULFATE-RESISTANT CONCRETE: Not required for this project.

3.12 ENTRAINED-AIR CONTENT: When air-entrained concrete is required, air entrainment shall be produced by either adding an air-entraining agent at the mixer or by use of mill-produced air-entraining cement. When necessary to increase the air content to within the specified range, additional air-entraining admixture compatible with that already in the mixture shall be added at the mixer. Air content shall be based on measurements made in concrete mixtures at point of discharge at the job site.

Air content by total volume of concrete shall be:

- 4% to 6% for 1 1/2" maximum size coarse aggregate
- 5% to 7% for 3/4" to 1" maximum size coarse aggregate
- 6 1/2% to 8 1/2% for 3/8" to 1/2" maximum size coarse aggregate

Air content shall be determined in accordance with ASTM C 173 or C 231.

3.13 CORRECTIVE ADDITIONS: to remedy deficiencies in aggregate gradations shall be used only on written approval from the Engineer.

3.14 PLACING REINFORCEMENT

A. GENERAL: Comply with CRSI "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as specified.

1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
3. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Engineer.

4. Place reinforcement to maintain minimum coverage as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.15 JOINTS

- A. **CONSTRUCTION JOINTS:** Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Engineer.
- B. **KEYWAYS:** Provide keyways at least 1 1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. **CONSTRUCTION JOINTS:** Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.
- D. **BONDING AGENT:** Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. **WATERSTOPS:** Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.
- F. **ISOLATION JOINTS IN SLABS-ON-GRADE:** Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
- G. **CONTRACTION (CONTROL) JOINTS IN SLABS-ON-GRADE:** Construct contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, unless otherwise indicated.
 1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab cured, remove inserts and clean groove of loose debris.
 2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 3. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and locate to conform to bay spacing wherever possible (at column centerlines, at half bays, third bays).
 4. Joint fillers and sealants shall be as specified on plans.

- 3.16 **SLUMP:** shall be determined in conformance with ASTM C 143, and shall be within the following limits, provided the required strength is obtained:

Slump Range (inches)		
<u>Class of Concrete</u>	<u>Non-Vibrated</u>	<u>Vibrated</u>
AA	2-5	2-4
A	2-5	2-4
B	2-5	2-4

C	2-5	2-4
D	2-5	1-3

3.17 PREPARATION FOR PLACING: Water shall be removed from excavation before placing concrete. Any flow of water shall be diverted through proper side drains and shall be removed without washing over freshly deposited concrete. Hardened concrete, debris, and foreign materials shall be removed from interior of forms and from inner surfaces of mixing and conveying equipment. Reinforcement shall be secured in position, and shall be inspected, and approved by the Engineer, or his authorized representative, before placing concrete. Runways shall be provided for wheeled concrete-handling equipment; such equipment shall not be wheeled over reinforcement, nor shall runways be supported on reinforcement.

3.18 INSTALLING EMBEDDED ITEMS

- A. GENERAL:** Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. FORMS FOR SLABS:** Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.19 PREPARING FORM SURFACES

- A. GENERAL:** Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.
- B. APPLICATION:** Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

3.20 VAPOR RETARDER/BARRIER INSTALLATION

- A. GENERAL:** Place vapor retarder/barrier sheeting in position with longest dimension parallel with direction of pour.
- B. JOINTS:** Lap joints 6 inches and seal with manufacturer's recommended mastic or pressure-sensitive tape.

3.21 PLACING CONCRETE: Concrete shall be handled from mixer to transport vehicle to place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredient until the approved unit of operation is completed. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete. Concrete shall be placed in the forms, as close as possible in final position, in uniform approximately horizontal layers not over 12 inches deep. Forms splashed with concrete and reinforcement splashed with concrete or form coating shall be cleaned in advance of placing subsequent lifts. Concrete shall not be allowed to drop freely more than 5 feet in unexposed work nor more than 3 feet in exposed work; where greater drops are required, a tremie or other approved means shall be employed. The discharge of the tremies shall be controlled so that the concrete may be effectively compacted into horizontal layers not more than 12 inches thick, and the spacing of the tremies shall be such that segregation does not occur. Concrete to receive other construction shall be screeded to proper level to avoid excessive shimming or grouting. Conduits and pipes shall not be embedded in concrete unless specifically indicated.

- A. TIME INTERVAL BETWEEN MIXING AND PLACING:** Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed in forms within 45 minutes from the time ingredients are charged into the mixing drum. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site

of the work and discharge completed in the forms within 60 minutes, except that when the concrete temperature exceeds 85 degrees F., the time shall be reduced to 45 minutes. Transit-mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1 1/2 hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge.

- B. COLD-WEATHER REQUIREMENTS:** Concrete shall not be placed when, without special protection, the concrete is likely to be subjected to freezing temperature before the expiration of the specified curing period. If necessary to place concrete under conditions of low temperature, placement shall be approved by the Engineer, or his authorized representative. The temperature of the concrete when placed shall be not less than 50 degrees F. Heating of the mixing water and/or aggregates will be required as necessary to maintain the minimum concrete temperature of 50 degrees F., and all methods and equipment for heating shall be subject to approval. Materials entering the mixer shall be free from ice, snow, frost, and frozen lumps. Suitable covering and other means that will not stain concrete, as approved, shall be provided for maintaining the concrete at the temperatures and periods specified in paragraph CURING. Salt, chemicals, or other materials shall not be mixed with the concrete to prevent freezing, except that calcium chloride may be used as an accelerating agent, after written approval from the Engineer's representative, when the weather is cold enough to require protection of the concrete from freezing. The amount of calcium chloride shall not exceed 2 percent by weight of the cement being used. The use of calcium chloride in concrete shall not, in any way, relieve the Contractor of responsibility for compliance with the requirements of these specifications governing protection and curing of the concrete. Any concrete damaged by inadequate protection or procedure shall be removed and replaced at no additional cost to the Owner.
- C. HOT-WEATHER PLACEMENT:** When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305.1 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F. Mixing water may be chilled 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. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
 4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.
- D. CONVEYING CONCRETE BY CHUTE, CONVEYOR, OR PUMP:** Concrete may be conveyed by chute, conveyor, or pump if approved in writing. In requesting approval, the Contractor shall submit his entire plan of operation from time of discharge of concrete from the mixer to final placement in the forms, and the steps to be taken to prevent the formation of cold joints in the event the transporting of concrete by chute, conveyor, or pump is disrupted. Aluminum chutes and pipelines shall not be used for placing concrete. Conveyors and pumps shall be capable of expeditiously placing concrete at the rate most advantageous to good workmanship. Approvals will not be given for chutes or conveyors requiring changes in the concrete materials or design mix for efficient operation.

- E. VIBRATION:** Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.1. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators 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 set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- F. PLACING CONCRETE SLABS:** Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.
- 3.22 COMPACTION:** Immediately after placing, each layer of concrete shall be compacted by internal concrete vibrators supplemented by hand spading, rodding, and tamping. Tapping or other external vibration of forms will not be permitted. Vibrators shall not be used to transport concrete inside forms. Internal vibrators submerged in concrete shall maintain a speed of not less than 7,000 impulses per minute. The vibrating equipment shall at all times be adequate in number of units and power to properly consolidate all concrete. Spare units shall be on hand as necessary to insure such adequacy. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing objectionable segregation. The vibrator shall not be inserted into lower courses that have begun to set. Vibrators shall be applied at uniformly spaced points not farther apart than the visible effectiveness of the machine.
- 3.23 BONDING:** Before depositing new concrete on or against concrete that has set, the surfaces of the set concrete shall be thoroughly cleaned so as to expose the coarse aggregate and be free of laitance, coatings, foreign matter, and loose particles. Forms shall be retightened. The cleaned surfaces may be moist but shall be without free water when concrete is placed.
- 3.24 FINISHES OF CONCRETE:** Within 12 hours after forms are removed, surface defects shall be remedied as specified herein. Temperature of the concrete, ambient air, and mortar during remedial work including curing shall be above 50 degrees F. Fins and loose material shall be removed. Honeycomb, aggregate pockets, voids over 1/2 inch in diameter, and holes left by the rods or bolts shall be cut out to solid concrete, reamed, wetted, brush-coated with neat cement grout, and filled with mortar. Mortar shall be a stiff mix of 1 part Portland cement to not more than 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water using white Portland cement for all or part of the cement so that when dry, the color of the mortar shall match the adjoining concrete color. Mortar shall be thoroughly compacted in place. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. Holes that do not pass entirely through the wall shall be packed full. Patchwork shall finish flush and in the same place as adjacent surfaces. Exposed patchwork shall be finished to match adjoining surfaces in texture and color. Patchwork shall be damp-cured for 72 hours. Protruding portions of bar supports shall be ground flush with concrete surfaces that will be exposed, painted, or plastered directly. Unless otherwise provided in the General Requirements, all exposed edges or corners of formed structural concrete shall be chamfered 3/4". The absence of a chamfered corner or edge on a drawing does not relieve the Contractor of including the chamfer.

3.25 TYPE OF FINISH: Unless otherwise required by another section of the specifications, the plans, or General Requirements, all exposed surfaces, except floors, shall receive a "rubbed" finish and all unexposed surfaces shall have an "ordinary" finish, as described below. All floors shall receive a standard floor finish.

- A. RUBBED FINISH:** After concrete has set sufficiently to permit, the exposed surfaces shall be thoroughly wetted and rubbed with a carborundum or other abrasive of equal quality to bring the surface to a smooth texture and remove all form marks. The paste formed by the rubbing as above described may be spread uniformly over the surface and allowed to take a reset, after which it shall be finished by floating with a canvas, carpet-faced or cork float or rubbed down with dry burlap.
- B. ORDINARY FINISH:** An "Ordinary Finish" is defined as the surface left by the removal of the forms with all holes left by form ties filled and all defects repaired. The surface shall be true and even, free from stone pockets, depressions or projections beyond the surface. All surfaces which cannot be repaired to the satisfaction of the Engineer shall be given a "rubbed" finish.
- C. CONCRETE FLOOR FINISH:** After concrete has been placed, properly consolidated by vibration, and screeded to proper grade, the concrete surface shall be lightly tamped to force large aggregate slightly below the surface and then floated. Floating by power-driven floats or by hand floats shall begin when surface water has disappeared and/or concrete has stiffened sufficiently.

Power troweling shall begin as soon as little or no cement paste clings to blades. Troweling shall be continued until surface is dense, smooth, and free of all minor blemishes, such as trowel marks. Final hand troweling shall be continued until ringing sound is heard as trowel passes over surface.

Surface of concrete shall be checked for level to a tolerance not exceeding 1/8" in 10 feet when tested with a 10 ft. straightedge placed on surface at not less than two different angles. High spots shall be cut down and low spots filled. Surfaces shall be uniformly sloped to drains. Immediately after leveling, surface shall be re-floated to a smooth uniform texture. If variations greater than this exist, the Engineer may direct the Contractor to grind the floor to bring surface within requirements. Patching of low spots shall not be permitted. Grinding shall be done as soon as possible, preferably within 3 days, but not until concrete is sufficiently strong to prevent dislodging coarse aggregate particles.

3.26 CURING AND PROTECTION: Immediately after completion of finishing operations and as soon as marring of concrete will not occur, all exposed concrete surfaces shall be cured by covering with a white pigmented curing compound. Concrete shall not be left exposed for more than 1/2 hour during the curing period. Curing shall be maintained continuously for 72 hours.

- A. CURING:** Concrete surfaces shall be uniformly sprayed with white pigmented curing compound immediately after completion of surface finishing and as soon as surface water evaporates. Curing compound shall not be applied during rainfall.

Curing compound shall be applied under pressure by mechanical sprayers at the rate recommended by the manufacturer, but in no case less than 1 gallon per 100 square feet of surface area. Spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At time of use, the compound shall be thoroughly mixed. During application, the compound shall be stirred continuously by mechanical methods. Hand spraying of irregular widths or shapes and on surfaces exposed by form removal will be permitted provided curing compound has been thoroughly agitated prior to placing in the sprayer. Curing compound shall not be applied to inside faces of joints to be sealed. In split slab construction, curing compound shall be applied in such manner as to prevent spraying exposed tie bars.

When the side forms are removed before the end of the 72-hour curing period, the

exposed sides of concrete shall be immediately protected by applying a curing compound equal to that provided for the surface.

B. RAIN PROTECTION: Prior to beginning daily concrete placement operations, the contractor shall have available at the jobsite sufficient polyethylene sheeting materials to properly protect the last 1 hour's operation against the effects of rain. The surfaces and sides shall be covered with polyethylene sheeting, when required. Units shall be lapped at least 18 inches. Sheeting shall be placed and weighted down so that it will remain in contact with the surface. Sheeting shall be large enough to extend beyond concrete edges at least twelve inches. Visible surface damages by rainfall shall be ground to a smooth texture as specified above or otherwise repaired by the Contractor to the satisfaction of the Engineer.

C. TEMPERATURE: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

3.27 COLD WEATHER PROTECTION: When concrete is being placed and the air temperature is expected to drop below 35 degrees Fahrenheit, a sufficient supply of straw, hay, grass, or other approved blanketing material shall be available at the jobsite. When the temperature is expected to reach the freezing point during the day or night, the protective material shall be spread over the concrete to a sufficient depth to prevent freezing. Concrete damaged by freezing shall be removed and replaced at no direct pay.

3.28 CONCRETE SURFACE REPAIRS

A. PATCHING DEFECTIVE AREAS: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Engineer.

B. PATCHING PROCEDURE: Mix dry-pack mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than one inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas 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.

C. REPAIRING FORMED SURFACES: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, 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 shown or required to complete Work.

D. REPAIRING UNFORMED SURFACES: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces 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. Proprietary underlayment compounds may be used when acceptable to Engineer.
4. Repair defective areas, except random cracks and single holes not exceeding one inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

3.29 QUALITY ASSURANCE: Testing except as otherwise specified herein shall be performed by an approved testing laboratory and at no cost to the Contractor.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT: No measurement will be made for cast-in-place concrete as a separate item, but shall be included in other items as specified.

END OF SECTION 03301

SECTION 04100
MORTAR

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Mortar and grout for unit masonry.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, normal-Type I.
- B. Masonry Cement; ASTM C98, for general use.
- C. Mortar Aggregate: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing, and foreign matter.
- D. Grout Course Aggregate: Specifications for aggregates for masonry grout ASTM C404.
- E. Grout Fine Aggregate: Specification for masonry mortar ASTM C144, except that all sand for mortar in 1/4" joints shall pass a no. 16 sieve.
- F. Hydrated Lime: ASTM C207, Type S.
- G. Water: Clean and potable.

2.02 MIXES

- A. Mixes: ASTM C270, Type as specified below, using the Property Method.
 - 1. Mortar for masonry in contact with earth and exterior masonry: Type S.
 - 2. Mortar for non-load bearing interior walls and partitions: Type N.
 - 3. Mortar for reinforced masonry: Type S.
 - 4. Interior pointing mortar: Type N.
 - 5. Exterior pointing mortar: Type S.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar or grout.
- C. If water is lost by evaporation, retemper within one hour of mixing. Do not retemper mortar after one hour of mixing.
- D. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

2.04 GROUT MIXES

- A. Mixes for bond beams, lintels and engineered masonry: 3000 psi strength at 28 days, 7-8 inch slump, mixed in accordance with ASTM C467 coarse grout.
- B. Mixing: Thoroughly mix ingredients in quantities needed for immediate use in accordance with ASTM C476 coarse grout. Do not use anti-freeze compounds to lower the freezing point of mortar.

2.05 MORTAR COLOR

- A. Mortar Color: Add pigments as directed by Architect, but not to exceed 15 percent of the weight of the cement, except that carbon black shall not exceed three percent of the weight of the cement.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install mortar and grout in accordance with 04300.
- B. Work grout into cores and cavities to eliminate voids.
- C. Do not displace reinforcing steel when placing grout.
- D. Clean concrete grout spaces of excess mortar and debris.
- E. Grout hollow metal frames for doors and other openings.
- F. Brace masonry for wet grout pressure.

END OF SECTION

**SECTION 04221
CONCRETE MASONRY BUILDING**

PART 1 - GENERAL

1.01 DESCRIPTION

Work covered by this section includes all labor, tools, equipment and materials required to install reinforced single wythe concrete masonry building walls as shown on the drawings and specified herein.

1.02 RELATED WORK

- A. 03300 – Cast-in-Place Concrete
- B. 09910 – Painting and Coating

1.03 REFERENCES

- A. ASTM A-82..... Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
- B. ASTM A-116..... Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
- C. ASTM A-496..... Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
- D. ASTM A-615..... Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- E. AWWA A-641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
- F. ASTM A-653..... Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- G. ASTM A-767 Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- H. ASTM C-90 Standard Specification for Load bearing Concrete Masonry
- I. ASTM C-270 Standard Specification for Mortar for Unit Masonry
- J. ASTM C-476 Standard Specification for Grout for Masonry

1.04 QUALITY ASSURANCE

Concrete Masonry Units (CMU) shall be manufactured and supplied by a single – source manufacturer, who has produced products for not less than 10 years. Units shall be free from defects. Any defective products shall not be used in work and shall be removed from project site.

1.05 SUBMITTALS

- A. **General:** Contractor to provide 6 copies of the following required submittals to Engineer for approval.
- B. **Product Data:** Provide manufacturer's standard product data sheets, storing instructions, installation instruction, and drawings. As a minimum, submittals shall be provided for:
 - a. Concrete masonry unit standard drawings showing shapes, types and dimensions of units to be used.
 - b. Concrete mix design for CMU
 - c. Mortar mix design
 - d. Grout mix design

- e. Joint reinforcement
- f. Metal flashing

1.06 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall be responsible for the delivery, storage and handling of products in accordance with the manufacturer's recommendations.
- B. Mortar and grout shall be stored in manufacturer's original packaging, and kept clean, dry, and protected against dampness.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS (CMU)

- A. Concrete masonry units shall be hollow load bearing block units conforming to ASTM Specification C90 (latest revision). Units shall be Type 1 – moisture controlled.
- B. Solid concrete masonry sill units shall be used at all door openings. Units shall be provided with manufactured slope toward exterior face of unit for positive drainage away from unit. Unit shall also have manufactured chamfered edge at exterior face of unit. Units shall conform to ASTM C90, Type 1- Moisture controlled.
- C. Manufactured corner, control joint, and bond beam units shall be used on this project. Modifying standard block units for use at corners, control joints, lintels or bond beams will not be acceptable on this project.

2.02 STEEL REINFORCEMENT

- A. CMU horizontal reinforcement shall be manufactured, deformed, "ladder" type, zinc-coated, cold-drawn steel conforming to ASTM A82, A116, A496 and A641. Reinforcing shall consist of two deformed longitudinal wires number 9 gage or larger, weld connected with number 12 gage or larger cross wires. Out-to-out spacing of longitudinal wires should be 1 5/8" less than the width of the masonry units. The distance between welded contacts of cross wires with each longitudinal wire shall not exceed 16 inches. Zinc coating shall be applied to a weight of not less than 0.4oz. per square foot of uncoated wire surface. Joint reinforcement shall be furnished in flat sections 10 to 20 feet in length. Manufactured shaped sections shall be used at all corners and wall intersections. Lap reinforcing a minimum of 6".
- B. Reinforcing steel bars shall be 60 ksi minimum yield strength conforming to ASTM A615 and A767. Deformed bars shall be used except where shown otherwise on drawings. Sizes shall be as shown on drawings.

2.03 MORTAR AND GROUT

- A. Mortar for masonry construction shall conform to ASTM C270. Mortar shall be type S having a minimum compressive strength of 1800psi. at 28 days. Color shall be as selected by Engineer. Anti-freeze admixtures will not be allowed on this project.
- B. Grout for bond beams, lintels, filling vertical cells, and other masonry construction shall conform with ASTM C476. Grout shall be coarse type having a minimum compressive strength of 2500psi at 28 days. Anti-freeze admixtures will not be allowed on this project.

2.04 FLASHING

Flashing shall be 24 gage steel conforming to ASTM A653. Flashing shall be provided with formed drip edge as shown on drawings.

2.05 CONTROL JOINTS

Control joints shall be constructed with manufactured rubber or neoprene preformed control joint strips. Control joints shall be shaped to match concrete masonry control joint units.

2.06 LUMBER

All lumber shall be surfaced four (4) sides and the dressed sizes shall conform to the Department of Commerce's Simplified Practice Recommendations F-16-39.

1. The lumber grades for the various portions of the work shall be as follows:
 - a. No. 2 Treated Yellow Pine sills or heel plates - all lumber in contact with concrete.
 - b. No. 2 Dense Southern Yellow Pine, or equivalent grade of fir, studs, plates, ceiling joists, rafters, external trim.
 - c. No. 3 Dense Southern Yellow Pine, or equivalent grade of fir, furring, blocking, bracing, nailers, purlins.

All lumber in contact with concrete and as shown on the drawings as "treated" shall be pressure treated with water repellent and paintable material. The maximum allowable moisture content of the wood prior to treatment shall be not over 25% oven dry basis. Treatment is to be by pressure processes. The minimum net retention of the preservative is to be not less than 6 pounds per cubic foot.

2.07 HARDWARE

All hardware shall be stainless steel with satin finish. The single door settings shall each have 3 stainless steel hinges with 5 knuckles. The locksets shall be keyed the the Owners master lock. The handles shall be ADA compliant lever handles. The exterior doors shall include automatic closers with hold-open. The thresholds shall be aluminum with an ADA compliant 1/2" maximum height.

2.08 FASTENERS AND CONNECTORS

All nails, bolts, etc., shall be adequate in size for the purpose for which they are used. Nails used to attach corrugated metal siding or roofing shall be aluminum or galvanized screw-thread nails with neoprene water-tight washers, 2 inches in length. All metal connectors shall be as specified on the plans.

2.09 CAULKING

All caulking compound shall be paintable silicon, light in color, elastic and waterproof.

2.10 DOORS

All doors shall be as specified on the plans.

2.11 AUXILLARY EQUIPMENT

All auxiliary equipment such as wall heaters, exhaust fans, sinks, etc., shall be as specified on the plans.

2.12 CONCRETE

All concrete shall be installed and finished in accordance with Section 03 30 00 of these specifications.

2.13 ELECTRICAL WORK

Electrical work shall be in accordance with Section 26 05 10 of these specifications

2.14 PAINT

All interior and exterior surfaces exposed in the finished work excluding floors and slabs shall be painted. Painting shall be in accordance with specification Section 09 91 00. The colors shall be as selected by the Owner.

PART 3 - INSTALLATION

3.01 General

- A.** Construction of concrete masonry shall be in strict accordance with the Concrete Masonry Handbook as published by the Portland Cement Association (latest revision).
- B.** Cutting of individual masonry units prior to installation shall be with power masonry saw. Masonry shall be laid plumb, true to line, with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and re-laid with fresh mortar. Courses shall be so spaced that backing masonry will level off, flush with the face work at all joints where ties occur. Chases and raked-out joints shall be kept free from mortar or other debris.

3.02 COURSING

Concrete masonry units shall be laid in running bond for this project. Masonry mortar joints shall be laid with uniform thickness of 3/8". Mortar joints shall have raked finish on exterior and interior of walls.

3.03 PLACING AND BONDING

- A.** Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B.** Lay hollow masonry units with face shell bedding on head and bed joints.
- C.** Remove excess mortar as work progresses.
- D.** Interlock intersections and external corners.
- E.** Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F.** Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G.** Cut mortar joints flush where wall base is scheduled.

3.04 WEEPS

Install weeps above through wall flashing at a maximum 48" on center horizontally in first course above bottom of wall.

3.05 HORIZONTAL JOINT REINFORCEMENT

Horizontal joint reinforcement shall be installed at 16" on center vertically. Lap reinforcement at ends a minimum distance of 12". Joint reinforcement shall be interrupted/discontinued at control joints.

3.06 FLASHING

Flashing shall be installed at locations shown on drawings. Flashing shall be lapped at ends a minimum distance of 6". Turn flashing, fold, and seal at corners, bends and interruptions. Provide drip edge where shown on drawings.

3.07 BOND BEAMS AND LINTELS

- A.** Bond beams and lintels shall be installed over all masonry opens and at locations shown on drawings. Grout fill shall be placed and consolidated without displacing steel reinforcement. Masonry bond beams and lintels shall attain their specified strength before temporary supports are removed.
- B.** Reinforcing at control joints shall be discontinued as detailed on drawings. Where splices are required for continuity, reinforcement shall be lapped 24 bar diameters or 12 inches, whichever is greater.

3.08 MORTAR

Materials shall be accurately measured proportions and mixed with as much water as may be necessary to produce the wettest workable consistency possible. Mortar shall be placed in final position within 2 hours after mixing. Mortar not used or that has started to set within this time interval shall be discarded. Mortar that has stiffened within the above time interval, because of evaporation of moisture from the mortar, shall be re-tempered to restore its workability.

3.09 HOT WEATHER INSTALLATION

Masonry erected when the ambient air has a temperature of more than 99 degrees F., in the shade, and has a relative humidity of less than 50 percent shall be protected from direct exposure to wind and sun for 48 hours after installation.

3.10 COLD WEATHER INSTALLATION

No frozen work shall be built upon. Before erecting masonry during temperatures below 40 degrees F., a written statement shall be submitted and approval received of the methods proposed to heat the masonry materials and protect the masonry from freezing as required below. Masonry units shall be kept completely covered and free from frost, ice, and snow at all times and shall have a minimum temperature of 30 degrees F. when laid. Temperature of mortar, and, if used, grout shall be between 70 degrees F. and 110 degrees F. Temperature of mixing water or of water and sand introduced to cement shall not exceed 160 degrees F. The air temperature on both sides of the masonry shall be maintained above 40 degrees F. for at least 72 hours but may be reduced to 48 hours if high-early-strength cement is used instead of Portland cement or masonry cement in the mortar. No masonry shall be laid at temperatures below minus 10 degrees F. unless authorized in writing.

3.11 ACCOMMODATION OF ACCESSORIES AND FIXTURES

- A.** Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics. Wherever possible, full units of the proper size shall be used in lieu of cut units. Cut edges shall be clean, true, and sharp. Openings shall be carefully cut, formed, or otherwise neatly made for recessed items and for electrical, plumbing, or other mechanical installations so that wall plates, cover plates, or escutcheons required by the installation will completely conceal the openings and will have bottoms in alignment with lower edge of masonry joints. Webs of hollow masonry units shall be cut the minimum required for the installation. Reinforced-masonry or structural steel lintels shall be provided as indicated above openings over 12 inches wide for pipe, ducts, and cable trays, unless steel sleeves are used.
- B.** Openings around flush mounted electrical outlet boxes in wet locations shall be pointed flush with mortar including flush joint above the box. Anchors, ties, wall plugs, accessories, flashings, pipe sleeves, and other items required to be built in shall be built in as the masonry work progresses. Anchors, ties, and joint reinforcement shall be fully embedded in mortar. Cells receiving anchor bolts and cells of first masonry course below bearing plates shall be filled solidly with mortar or grout.

3.12 PROTECTION

Surfaces of masonry not being worked on shall be properly protected at all times. When rain or snow is imminent, the tops of exposed masonry (and structural woodwork over which brickwork is placed) shall be covered with a strong non-staining waterproof membrane well secured in place and in a manner that will prevent moisture from accumulating within the unfinished wall. Adequate provisions shall be made during construction to prevent damage by wind.

3.13 SOLID FILLED VERTICAL CELLS

Vertical cells adjacent to door frames shall be reinforced and filled solid with grout.

Vertical cells shall also be reinforced and grout filled at a maximum horizontal spacing of 48" on center. Reinforcing shall be continuous from building foundation to top of wall bond beam and/or lintels.

Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, continuous vertical cell measuring not less than 2 by 3 inches. Vertical reinforcement shall be continuous and rigidly secured at top and bottom and at intervals necessary to hold the reinforcing in proper position.

3.14 WORK STOP AT END OF DAY

Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Before laying new work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

3.15 POINTING AND CLEANING

Mortar daubs or splashings, before setting or hardening, shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, all defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.16 EQUIPMENT INSTALLATION

All equipment, controls, doors, hardware, etc., shall be installed in strict accordance with the manufacturer's instructions and shop drawings.

3.17 FRAMING

The drawings and details indicate the framing of the building, and the work must be done in accordance with the drawings and the specifications and the directions of the Engineer.

Framing lumber and other rough work shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place.

3.18 BRIDGING

Joists shall be bridged as required. Provide a minimum of one row of cross bridging for spans over 8 feet, but less than 16 feet and two rows for spans 16 feet and over. Wood bridging shall be not less than 1 x 3 inch nominal size for 2 inch thick and larger sized joists and shall have ends accurately level-cut to afford firm contact with the sides of the joists. Wood bridging shall be nailed at each end with 2 eight-penny nails.

3.19 CAULKING

Caulking shall be installed in all joints around wood or metal frames built into exterior walls and around or in any other joints so indicated on the drawings. Where jamb and head joints occur between exterior door frames, louver or grill frames, adjoining abutting materials, completely fill perimeter with caulking compound.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

- A. Measurement:** No measurement will be made for work described in this section as a separate item, but shall be included in other items as specified.
- B. Payment:** Work described in this section will be paid for in the various bid items as specified.

END OF SECTION 04221

SECTION 04300
MASONRY & ARCHITECTURAL CAST STONE SILLS, BANDS, & TRIM

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Concrete and Brick units.
- B. Reinforcement, anchorages, and accessories.
- C. Concrete Masonry Units (CMU)
- D. Architectural Cast Stone. Also see Section 04720 - Architectural Cast Stone

1.02 ENVIRONMENTAL REQUIREMENTS

- A. Hot Weather Requirements: In accordance w/ ACI 530.1 when ambient temp. is greater than 100 deg F or ambient temp is greater than 90 F w/ wind greater than 8mph.
- B. Cold Weather Requirements: In accord w/ ACI 530.1 when ambient temperature or temperature of masonry is less than 40F.

1.03 MOCKUP

- A. Provide mockup under provision of Section 01400.
- B. Construct mockup area as indicated on Exterior Elevations, including but not limited to mortar, and exterior wall components, exterior sheathing, damproofing, thru wall flashing, metall stud framing, gypsum board, sealants, accessories..
- C. Obtain approval prior to proceeding with the work.
- D. Remove the panel when directed by the Architect.

1.04 CERTIFICATES

- A. Submit manufacturer's certificates under provisions of Section 01400.
- B. Submit manufacturer's certificate that face brick and concrete masonry materials meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 530 and ACI 530.1

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Non-Load Bearing Units: ASTM C129, Type I; hollow; light weight.
- B. Load Bearing Units: ASTM C90, Type I, Hollow; light weight.
- C. Masonry Units: Modular sized to 8 x 4 x 16, 8 x 6 x 16, 8 x 8 x 16, 8 x 12 x 16 inch; provide special units for 90 degree corners, pilasters, sills, bond beams, slotted units and lintels as required and as indicated on drawings.
 - 1. Aggregate: Aggregate shall be light weight expanded clay conforming to ASTM C331. Units shall have oven dry weight of less than 105 lbs. per cubic foot.
 - 2. Shrinkage: Drying shrinkage shall not exceed 0.035 percent for the light weight units as determined by ASTM C426.
 - 3. Water Content: At the time of delivery to the job site, concrete masonry units shall have a moisture content in conformance with Table 1 of ASTM C90 for linear shrinkage from 0.03 to 0.045 percent.

Ship all units from the factory and store at the job site with all necessary protection to prevent increase of water content from rain and other sources.

- D. Special Shapes:
 - 1. Use special shapes as indicated on drawings, as specified herein, or as required for complete job.
 - 2. Provide eight inch Knockout Beam type where pilasters intersect Bond Beams.

2.02 BRICK UNITS

- A. Face Brick shall be Modular Size 3 1/2" to 3 5/8" wide, 2 1/4" high and 7 1/2" to 7 5/8" long.
- B. Face Brick shall be "**Old St. Louis**" reclaimed machine made **Red Brick** or approved equal.

ASTM C216 Grade SW, Type FBS and as follows:

Average Compressive Strength of 3000 psi

Rate of Absorption per ASTM C67 of less than 20g/30 sq.in.and is rated "not-effloresced"

2.03 CAST STONE CONCRETE SILLS, BANDS, TRIM-

- A. Refer to drawings for shapes and locations. Sizes shall be uniform with preformed inside and outside corners where required. Note special shapes required. Units shall be special shapes manufactured by one of the following or approved equal to be submitted under provisions of 01300:
 - Arrisicraft Corporation, Lombardo, IL (phone 519-653-3275, fax 519-653-1337) or Cocreham Brick and Stone, Baton Rouge, LA (distributor)
 - Continental Cast Stone Manufacturing, Inc Shawnee, Kansas (phone 913-422-7575, fax 913-422-7272) or Alajon, Inc, Trussville, AL (distributor)
- B. Band and Sill Units shall be profile shown in lengths of approximately 18". Sill units with sloped projection and drip. Provide special shapes for finished ends and corners.
 - 1. Units shall meet ASTM C1364 standard for Cast Stone with compression

strength of 6500 psi, absorption of 6% or less under ASTM C642 or ASTM C1195.

2. Finish shall be fine grained texture with no holes, air voids or other surface blemishes.
3. Color to be selected from at least 12 manufacturers standards.
4. Materials shall consist of Portland Cement (ASTM C150) white or gray for the specific color to be selected' aggregates meeting ASTM C33 and pigments meeting ASTM C979. Any reinforcement shall be galvanized or epoxy coated. Admixtures of intergral water repellants may additional be required.

- C. *Contractor shall note that special mortar meeting the requirement of the stone manufacturer may be required and that anchors used with these items shall be non-corrosive type (galvanized or stainless steel).*

2.04 REINFORCEMENT AND ANCHORAGES

- A. Multiple Wythe Joint Reinforcement: Continuous truss type with moisture drip; galvanized 3/16 inch side rods with 3/16 inch cross tiles.
- B. Reinforcing Steel: Type specified in Section 03300.
- C. Anchors: Face brick and CMU.
1. To structural concrete columns and beams: 12 gage anchor factory assembled to 3/16 inch diameter mill galvanized triangle ties. Provide dovetail anchor slots to receive anchor. Protect with foam filler during concrete pour. Space dove tail slots at 16" o.c.
- D. Anchors: Face brick. (Ties)
1. To structural steel (columns) 12 gage x 3/4 inch x 9 inch stud plate column anchors with 3/16 inch diameter mill galvanized triangle ties.
 2. To walls (sheathing over metal studs, etc.) 12 gage x 3/4 inch x 9 inch plate anchors with 3/16 inch diameter mill galvanized triangle ties.

2.05 CONTROL JOINT MATERIAL

- A. Slot Seal shall be equal to Everlastic 2015-3, HB RS Series extruded rubber conforming to ASTM D-2000 2AA-805. Equal products by Hohmann & Barnard RS series or Wire-Bond are approved for bidding.

2.06 MASONRY AIRSPACE & WEEP

- A. Cav Clear Masonry Mat as manufactured by Archovations, Inc. (888-436-2620) or equal shall be used prevent mortar from making contact with the back up. Masonry mat shall be fluid conducting, non-absorbent, mold and mildew resistant polymer mesh consisting of 100% recycled plastic with binder. This product will be installed in the bottom 32" of the wall.
- B. Weep Vent Material shall be CavClear Weep Vents or equal. Material is a non-woven mesh with M notched bottom in color to match mortar (color to be selected by Architect).

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify items provided by other Sections of work are properly sized and located.
- B. Establish lines, levels, and coursing. Protect from disturbance.
- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

3.02 COURSING

- A. Place masonry to lines and levels indicated.
- B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal 8 inches. Form concave mortar joints.
- D. Lay brick in running bond. Form concave 3/8 inch mortar joints.

3.03 PLACING AND BONDING

- A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints and deep or excessive furrowing of mortar joints are not permitted.
- B. Fully bond intersections, and external and internal corners.
- C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- D. Remove excess mortar.
- E. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
- F. Provide masonry control joints as indicated on drawings or **as required to match existing conditions.**
- G. *Coordinate installation of brick with cast stone and anchors. Conduct preinstallation meeting to review dampproofing completion and method for assuring proper installation of masonry ties, control joints and sealant. Scaffolding shall not be removed until final inspection by Architect of brickwork and cast stone in place.*

3.04 TOLERANCES

- A. Alignment of Columns: Maximum 1/4 inch from true line.
- B. Variation from Unit to Adjacent Unit: 1/32 inch maximum.
- C. Variation from Plane of Wall; 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- D. Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/2 inch maximum.
- F. Variation of Joint Thickness: 1/8 inch in 3 feet.

- G. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

3.05 REINFORCEMENT AND ANCHORAGES

- A. Multiple Wythe joint reinforcement.
- B. Install horizontal joint reinforcement 16 inches o.c.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 16 inches each side of opening.
- D. Place joint reinforcement continuous in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches. Extend 16 inches minimum each side of opening.
- F. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension.
- G. Verify that anchorages embedded in concrete and attached to structural steel members are properly placed. Embed anchorages in every second joint.
- H. Embed triangle wall ties in concrete at maximum 16 inches o.c. vertically and 32 inches o.c. horizontally. Place at maximum 3 inches o.c. each way around perimeter of openings, within 12 inches of openings. Anchor to concrete using dovetail anchor slots corrosion-resistant.
- I. Reinforce joint corners and intersections with strap anchors at 16 inches minimum spacing.

3.06 LINTELS

- A. Install loose steel lintels as indicated on Drawings.

3.07 CONTROL JOINTS

- A. Control And Expansion Joints:
 - 1. Install control and expansion joints at the following maximum spacings, unless otherwise indicated on Drawings:
 - a. Exterior Walls: 20 feet on center and within 24 inches on one side of each interior and exterior corner.
 - a. Interior Walls: 30 feet on center.
 - b. At changes in wall height.
 - 2. Do not continue horizontal joint reinforcement through control and expansion joints.
 - 3. Size control joint in accordance with Section 07951 for sealant performance.
 - 4. Form expansion joint by omitting mortar and cutting unit to form open space.

3.08 CAVITY WALL

- A. Do not let mortar fall into cavity air space or plug weep holes; clean out promptly.

- B. Install cavity vents and weep holes in veneer at **24 inches on center horizontally**, above through-wall flashing, above shelf angles, and at bottom of walls.
- C. Place **mortar drainage system** at all through- wall flashing , above shelf angles, and at bottom of walls.

3.09 BUILT-IN WORK

- A. As work progresses, build-in metal door frames, reinforcing, flashings, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
- B. Build-in items plumb and level.
- C. Do not build-in organic materials subject to deterioration.

3.10 CUTTING AND FITTING

- A. Cut and fit for chases, pipes conduit, sleeves, grounds and other items which effect masonry. Cooperate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.
- C. Tooth new brick into existing masonry walls to match existing construction in all respects.

3.11 CLEANING

- A. Remove excess mortar and smears.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with a non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.
- D. Use non-metallic tools in cleaning operations.

3.12 PROTECTION

- A. Protect finished installation under provisions of Section 01500.
- B. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- C. Provide protection without damaging completed work.
- D. At day's end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

Section 04720

Architectural Cast Stone

PART 1 – GENERAL

1.1. Section Includes - Architectural Cast Stone.

- A. Scope - Cast Stone shown on architectural drawings and as described in this specification.
 - a. Manufacturer shall furnish Cast Stone covered by this specification.
- B. See Section 04300 – Masonry & Cast Stone Sills, Bands & Trim. Coordinate work with this Section.

1.2. Related Sections

- A. Section – 01300 – Submittal Procedures.
- B. Section – 04100 – Mortar.
- C. Section - 04220 - Concrete Masonry Units
- D. Section – 04300 – Masonry Grouting.
- E. Section – 07951 – Caulking & Sealants.

1.3. References

- A. ACI 318 – Building Code Requirements for Reinforced Concrete.
- B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.
- D. ASTM C 33 – Standard Specification for Concrete Aggregates.
- E. ASTM C 150 - Standard Specification for Portland Cement.
- F. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
- G. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- H. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete.
- I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- J. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units
- K. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
- L. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- M. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- N. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- O. ASTM C 989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
- P. ASTM C 1116 – Standard Specification for Fiber Reinforced Concrete and Shotcrete.
- Q. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- R. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.

- S. ASTM C 1364 - Standard Specification for Architectural Cast Stone.
- T. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- U. Cast Stone Institute® Technical Manual (Current Edition)

1.4. Definitions

- A. Cast Stone - a refined architectural concrete building unit manufactured to simulate natural cut stone, used in Division 4 masonry applications.
 - a. Dry Cast – manufactured from zero slump concrete.
 - i. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
 - ii. Machine casting method: Manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

Wet Cast – manufactured from measurable slump concrete.

- iii. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5. Submittal Procedures

- A. Comply with Section 01300 – Submittal Procedures.
- B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
- C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.
- D. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors, annotation of stone types and their location.
- E. Warranty: Submit Cast Stone Institute® Member Limited Warranty.
- F. Certification: Submit valid Cast Stone Institute® Plant Certification.

1.6. Quality Assurance

- A. Manufacturer Qualifications:
 - a. Cast Stone shall be produced in a plant certified by the Cast Stone Institute®.
 - b. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
 - c. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.

- B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.
- C. Mock-up (Optional) Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.
- D. Warranty Period: 10 years.

PART 2 – MATERIALS

2.1. Architectural Cast Stone

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
 - a. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.
 - b. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
 - c. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
 - d. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
 - e. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.
- C. Job site testing – One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m³) delivered to the job site.
 - a. Three field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
 - b. Three field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
 - c. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.2. Raw Materials

- A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
 - a. ASTM C 260 for air-entraining admixtures.
 - i. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
 - b. Other admixtures: Integral water repellents 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.
 - c. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
 - d. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
- F. Water – Potable

- G. Reinforcing bars:
 - a. ASTM A 615/A 615M: Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
 - b. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.
- H. Fiber reinforcement (optional): ASTM C 1116
- I. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3. Color And Finish

- A. Match sample on file in architect's office or match sample as approved for **Cast Stone as specified in Section 04300.**
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in.² and not obvious under direct daylight illumination at a 5 ft distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.
 - a. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - i. Total color difference – not greater than 6 units.
 - ii. Total hue difference – not greater than 2 units.
- D. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.
- E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.4. Reinforcing

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross section area.
- C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- D. Panels, soffits and similar stones greater than 24 in. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.
- E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.5. Curing

- A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C)) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6. Manufacturing Tolerances

- B. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. from approved dimensions.
- C. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ in., whichever is greater, not to exceed $\pm 1/4$ in.
- D. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- E. Warp, bow or twist of units shall not exceed length/ 360 or $\pm 1/8$ in., whichever is greater.
- F. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, $1/8$ in., on unformed sides of unit, $3/8$ in. maximum deviation.

2.7. Production Quality Control

- A. Testing.
- B. Test compressive strength and absorption from specimens taken from every 500 cubic feet of product produced.
- C. Perform tests in accordance ASTM C 1194 and C 1195.
- D. Have tests performed by an independent testing laboratory every six months.
- E. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.
- F. Retain copies of all test reports for a minimum of two years.

2.8. Delivery, Storage And Handling

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

PART 3 - EXECUTION

3.1. Examination

- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Unacceptable units shall not be set.

3.2. Setting Tolerances

- A. Comply with Cast Stone Institute® Technical Manual.
- B. Set stones $1/8$ in. or less, within the plane of adjacent units.
- C. Joints, plus - $1/16$ in., minus - $1/8$ in.

3.3. Jointing

- A. Joint size:
 - a. At stone/brick joints $3/8$ in.
 - b. At stone/stone joints in vertical position 4 in. ($3/8$ in. optional).
 - c. Stone/stone joints exposed on top $3/8$ in.
- B. Joint materials:
 - a. Mortar, Type N, ASTM C 270.
 - b. Use a full bed of mortar at all bed joints.
 - c. Flush vertical joints full with mortar.
 - d. Leave all joints with exposed tops or under relieving angles open for sealant.

- e. Leave head joints in copings and projecting components open for sealant.
- C. Location of joints:
 - a. As shown on shop drawings.
 - b. At control and expansion joints unless otherwise shown.

3.4. Setting

- A. Drench units with clean water prior to setting.
- B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- C. Set units in full bed of mortar, unless otherwise detailed.
- D. Rake mortar joints 3/4 in. in for pointing.
- E. Remove excess mortar from unit faces immediately after setting.
- F. Tuck point unit joints to a slight concave profile.

3.5. Joint Protection

- A. Comply with requirements of Section 07951.
- B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6. Repair and Cleaning

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners

3.7. Inspection and Acceptance

- A. Inspect finished installation according to Cast Stone Institute® Technical Bulletin #36.
- B. Do not field apply water repellent until repair, cleaning, inspection and acceptance is completed.

3.8. WATER REPELLENT

- A. Apply water repellent in accordance with Cast Stone Institute® Technical Bulletin #35 or water repellent manufacturer's directions.

END OF SECTION

**SECTION 05120
STRUCTURAL STEEL**

PART 1 - GENERAL

1.01 DESCRIPTION: Supply and install all structural steel work as indicated on the drawings and as specified herein.

1.02 SUMMARY

- A.** This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
 - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
 - 2. Miscellaneous Metal Fabrications, if any, are specified elsewhere.

1.03 RELATED WORK: Drawings and general provisions of Contract, including General and Supplementary Conditions and technical specification Sections, apply to this Section.

1.04 REFERENCES: Except where provisions of these specifications are more exacting, work of this Section shall comply with all applicable provisions of the following standards.

- A.** Standard Specifications for the Design and Fabrication of Structural Steel for Buildings, of the American Institute of Steel Construction.
- B.** Code of Standard Practice for Steel Buildings and Bridges, of AISC.
- C.** Code for Welding in Building Construction, D1.0 of the American Welding Society.

1.05 GENERAL:

- A. WORKMANSHIP:** Work shall comply with AISC "Manual of Steel Construction" unless more exacting requirements are specified in the Contract Documents.
- B. LAWS AND REGULATIONS:** Comply with all applicable Federal, State and Local codes and regulations including erection safety regulations for performance of the work of this Section.

1.06 SUBMITTALS:

- A. GENERAL:** Submit the following in accordance with Conditions of Contract and individual specification Sections.
- B. PRODUCT DATA:** Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. High-strength bolts (each type), including nuts and washers. Include Direct Tension Indicators if used.
 - 3. Structural steel primer paint.
 - 4. Shrinkage-resistant grout.
- C. SHOP DRAWINGS:** Shop drawings prepared per AISC Specifications, including

complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.

1. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols. Show size, length, and type of each weld.
2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

D. TEST REPORTS: Test reports conducted on shop and field-bolted and welded connections. Include data on types of tests conducted and test results.

1.07 QUALITY ASSURANCE

A. CODES AND STANDARDS: Comply with provisions of following, except as otherwise indicated:

1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges".
 - (a) Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence:

"This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections developed by the fabricator as a part of his preparation of these shop drawings."
2. AISC "Specifications for Structural Steel Buildings," including "Commentary".
3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.
4. American Welding Society (AWS) D1.1 "Structural Welding Code – Steel".
5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. QUALIFICATIONS FOR WELDING WORK: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.08 DELIVERY, STORAGE AND HANDLING

A. TIMELINESS: Deliver materials to site at such intervals to ensure uninterrupted progress of work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time not to delay work.

B. STORAGE: Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. If bolts and nuts

become dry or rusty, clean and re-lubricate before use. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL AND BOLTS: All structural steel and bolts shall be new and of basic open hearth process steel of domestic manufacture conforming to all applicable requirements of ASTM A-36, Structural Steel for Bridges and Buildings except as noted.

2.02 ANCHOR BOLTS: Anchor bolts shall be ASTM F1554-Gr. 36.

2.03 ELECTRODES: All arc-welding electrodes shall conform to ASTM A-233 for Steel Arc-Welding Electrodes. Electrodes shall be as recommended by their manufacturers for the positions and other conditions of actual use.

2.04 ZINC COATING: Where required by the drawings, Zinc coating shall be applied to components after fabrication, in accordance with the recommended practice of the American Hot-Dip Galvanizers Association per ASTM A 123 or ASTM A 153. Zinc coating may be applied to bolts, nuts and other small miscellaneous parts electrolytically per ASTM A 164.

2.05 REJECTS: Any material found missing, or material rejected because of misfits or faults of materials or workmanship, shall be supplied forthwith by the Contractor from local sources, if possible. Misfits or errors discovered during sorting or erection shall be corrected, or new fabricated material shall be furnished by the Contractor. Defective work and fasteners shall be replaced at the expense of the Contractor.

2.06 MATERIALS

A. METAL SURFACES: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and applying surface finishes.

B. STRUCTURAL STEEL SHAPES:

1. Wide Flange and Tee Shapes – ASTM A992 Grade 50
2. Angles Plates and Channels – ASTM A36
3. Anchor Rods – ASTM – F1554 Grade 36

C. COLD FORMED STEEL TUBING: ASTM A 500, Grade B.

D. HOT FORMED STEEL TUBING: ASTM A 501.

E. STEEL PIPE: ASTM A 53, Type S, Grade B; or ASTM A 501. Finish: Black, except where indicated to be galvanized.

F. STEEL CASTINGS: ASTM A 27, Grade 65-35, medium-strength carbon steel.

G. HEADED STUD TYPE SHEAR CONNECTORS: ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel with dimensions complying with AISC Specifications.

H. ANCHOR BOLTS: ASTM F 1554 Grade 36, non-headed type unless otherwise indicated.

- I. **UNFINISHED THREADED FASTENERS:** ASTM A 307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.
- J. **HIGH STRENGTH THREADED FASTENERS:** Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A 325.
 - (a) Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B 695, Class 50, or hot-dip galvanized complying with ASTM A 153.
- K. **DIRECT TENSION INDICATORS:** ASTM F 959, type as required. Use at Contractor's option.
- L. **ELECTRODES FOR WELDING:** Comply with AWS Code.
- M. **STRUCTURAL STEEL PRIMER PAINT:** Fabricator's standard rust-inhibiting primer (non-asphaltic).
- N. **NON-METALLIC SHRINKAGE RESISTANT GROUT:** Premixed, nonmetallic, noncorrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621.

2.07 FABRICATION

- A. **SHOP FABRICATION AND ASSEMBLY:** Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
 - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. **CONNECTIONS:** Weld or bolt shop connections, as indicated.
- C. **BOLT FIELD CONNECTIONS:** except where welded connections or other connections are indicated. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
- D. **HIGH-STRENGTH BOLTED CONSTRUCTION:** Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts".
- E. **WELDED CONSTRUCTION:** Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- F. **SHEAR CONNECTORS:** Prepare steel surfaces as recommended by manufacturer of

shear connectors. Weld shear connectors in field, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions.

- G. HOLES FOR OTHER WORK:** Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final shop drawings.
- H. THREADED NUTS:** Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
- I. HOLES:** Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.08 SHOP PAINTING

- A. GENERAL:** Shop-paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
 - 1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
 - 2. Do not paint surfaces scheduled to receive sprayed-on fireproofing, except to prime perimeter structural steel beams, columns, bracing and similar structural located within exterior wall construction. Prime surfaces to receive sprayed-on fireproofing only with a paint that has been specifically tested by the fireproofing manufacturer. The primer shall be applied in accordance with the manufacturer's published data and shall meet or exceed the fireproofing manufacturer's requirements.
 - 3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- B. SURFACE PREPARATION:** After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. As a minimum, clean steel in accordance with Society of Protective Coatings (SSPC) as follows; except to a more stringent surface preparation standard if required by primer manufacturer.
 - 1. Steel to be primed for perimeter elements: SSPC-SP7 "Brush Off Blast".
 - 2. Steel to be primed with alkyd primer: SSPC-SP3 Power Tool Cleaning.
- C. PAINTING:** Immediately after surface preparation, apply the primer of type listed below. Apply primer in accordance with manufacturer's instructions and at a rate to provide dry film thickness in the range of 2.5-3.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces. Coordinate the scope of painting with other specification sections.
 - 1. Perimeter Steel: - Zinc-rich Urethane Primer: Tnemec 394 Perimeprime (or prior approved equal). Zinc dust shall meet the requirements of ASTM D 520 Type II for allowable limits for lead, cadmium and heavy metals.
 - 2. Other steel elements to be coated: Alkyd modified oil primer. 10-99G (or prior approved equal).
- D. HOT DIP GALVANIZATION:** Exterior exposed steel structures shall be hot dip galvanized per ASTM A123-G 60.

2.09 SOURCE QUALITY CONTROL

- A. **GENERAL:** Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements. Promptly remove and replace materials or fabricated components that do not comply.
- B. **MEMBERS AND CONNECTIONS:** Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Promptly notify Engineer whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - CONSTRUCTION METHODS

3.01 WELDING: Perform shop and field welding in every detail in accordance with all applicable provisions of above-referenced AISC Specifications and with "Code for Welding in Building Construction" of the American Welding Society.

- A. **WELD DETAILS:** Comply with all of requirements for joints which are accepted without qualification tests under the "Code for Welding in Building Construction" (AWS Designation D1.0) of American Welding Society.
- B. **QUALIFICATIONS OF WELDERS:** Make welds only by operators who have recently been qualified by tests, as prescribed in the "Standard Qualification Procedure" (AWS Designation B3.0) of American Welding Society, except this provision need not apply to tack welds not later incorporated into finished welds carrying calculated stress.
- C. **TEMPLATES:** Furnish, together with instructions for setting of anchors, anchor bolts and bearing plates. Ascertain that items are properly set during progress of the work.

3.02 ERECTION:

- A. **TEMPORARY SHORING AND BRACING:** Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
- B. **TEMPORARY PLANKING:** Provide temporary planking and working platforms as necessary to effectively complete work.
- C. **SETTING BASES AND BEARING PLATES:** Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 - 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 - 2. Tighten anchor bolts 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 prior to packing with grout.
 - 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

4. For proprietary grout materials, comply with manufacturer's instructions.
 - D. **FIELD ASSEMBLY:** Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - E. **TRUENESS:** Level and plumb individual members of structure within specified AISC tolerances.
 - F. **STRUCTURE TEMPERATURE:** Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
 - G. **SPLICES:** Splice members only where indicated and accepted on shop drawings.
 - H. **ERECTION BOLTS:** On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
 1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
 - I. **GAS CUTTING:** Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
 - J. **TOUCH-UP PAINTING:** Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.
 - K. **TOUCH-UP GALVANIZED SURFACES:** Galvanized steel subject to field welding shall be cleaned and recoated with compatible galvalume paint.
- 3.03 PAINTING:** After erection of steel, coat all exposed surfaces of bolts, nuts and welds required for field assembly of shop painted steel. Repair abraded and damaged coating to approved condition.
- 3.04 QUALITY CONTROL**
- A. The Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
 - B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
 - C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.
- F. Shop-Bolted Connections shall be inspected or tested per AISC specifications.
- G. Inspect and test shop welds during fabrication of structural steel assemblies, as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
- H. Field-bolted connections are to be inspected in accordance with AISC specifications.
- I. Inspect and test field welds during erection of structural steel as follows:
 - 1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.

PART 4 - MEASUREMENT AND PAYMENT

- 4.01 STRUCTURAL STEEL WORK MEASURED AS PART OF ANOTHER BID ITEM:** No measurement will be made for structural steel work as a separate item, but shall be included in other items as specified.
- 4.02 STRUCTURAL STEEL WORK PAID FOR AS PART OF ANOTHER BID ITEM:** Structural steel work will be paid for in the various bid items as specified.

END OF SECTION 05120

DIVISION 05 - METALS

SECTION 05310 STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes steel deck units for floor and/or roof applications as shown on the Drawings.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.
 - 1. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.
 - (1) Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.
 - 2. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut opening, special jointing, and other accessories.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:
 - 1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members".
 - 2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel".
 - 3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks".
- B. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.
 - 1. Welded decking in place is subject to inspection and testing. Owner will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

- C. Underwriters Label: If shown on the Drawings, provide metal floor deck units listed in Underwriters Laboratories “Fire Resistance Directory”, with each deck unit bearing the UL label and marking for specific system detailed.
 - 1. Provide cellular floor deck units listed in UL “Electrical Construction Materials Directory” with each cellular metal floor deck unit bearing UL labels and marking. Provide units that will permit use of standard header ducts and outlets for electrical distribution systems.
- D. FM Listing: If shown on the Drawings, provide steel roof deck units that have been evaluated by Factory Mutual System and are listed in “Factory Mutual Approval Guide” for “Class I” fire-rated construction.

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 but are not limited to the following:
- B. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Epic Metals Corporation.
 - 2. Vulcraft Div., Nucor Corporation
 - 3. CSM Metal Deck

2.2 MATERIALS

- A. Steel for Painted Metal Deck Units: ASTM A 611, grade as required to comply with SDI specifications.
- B. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications.
- C. Miscellaneous Steel Shapes: ASTM A 36.
- D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.
- E. Galvanizing: ASTM A 525, G 60.
- F. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.
- G. Paint: If shown on the Drawings, “painted deck” shall have manufacturer’s baked-on, rust-inhibitive paint, for application to metal surfaces that have been chemically cleaned and phosphate chemical treated.
- H. Flexible Closure Strips: Manufacturer’s standard vulcanized, closed-cell, synthetic rubber

- I. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

2.3 FABRICATION

- A. General: Form deck units in lengths to span three or more supports, with flush, telescoped, or nested 2 inch laps at ends and interlocking or nested side laps, of metal thickness, depth, and width as indicated.
- B. Roof Deck Units: If shown on the Drawings, provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck".
- C. Non-Composite Steel Form Deck: If shown on the Drawings, provide fluted sections of metal deck as permanent forms for reinforced concrete slabs.
- D. Cellular Metal Floor Deck Units: (If shown on the Drawings)
 - 1. Fabricate flat-bottom units with top fluted section cells combined on a lower flat plate, of metal thickness, depth, and width of unit, number of cells per unit, and width of cells as indicated.
 - 2. Fabricate double-cell units with top fluted section cells combined with matching fluted bottom section, of metal thickness, depth, and width of units, number of cells per unit, and width of cells as indicated.
 - 3. Provide sufficient welds, forming sheets into cellular floor deck units to develop full horizontal shear strength at plane where steel sheets are joined.
- E. Composite Steel Floor Deck: If shown on the Drawings, fabricate deck units with integral embossing or raised pattern to furnish mechanical bond with concrete slabs. Fabricate open-beam deck units with fluted section having interlocking side laps.
- F. Metal Cover Plates: If shown on the Drawings, fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6 inches wide.
- G. Metal Closure Strips: If shown on the Drawings, fabricate metal closure strips, for cell raceways and openings between decking and other construction, of not less than 0.045-inch min. (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.
- H. Roof Sump Pans: If shown on the Drawings, fabricate from single piece of 0.071-inch min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Recess pans not less than 1 2 inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field by others.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's

recommendations, shop drawings, and as specified herein.

- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.
- D. Place deck units flat and square, secured to adjacent framing without warp or deflection.
- E. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
- F. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- G. Do not use floor deck units for storage or working platforms until permanently secured.
- H. Fastening Deck Units:
 - 1. Fasten floor deck units to steel supporting members by nominal 5/8 inch puddle welds or elongated welds of equal strength, as shown on the drawings with a minimum of two welds per unit at each support.
 - 2. Tack weld or use self-tapping No. 8 or larger machine screws at 4 feet o.c. for fastening end closures.
 - 3. Fasten roof deck units to steel supporting members by not less than 5/8 inch diameter puddle welds or elongated welds of equal strength, spaced as shown on the drawings at every support. In addition, secure deck to each supporting member in ribs where side laps occur.
 - 4. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
Use welding washers where recommended by deck manufacturer.
 - 5. Mechanical fasteners, either powder-actuated or pneumatically driven, may be used in lieu of welding. Locate mechanical fasteners and install in accordance with deck manufacturer's instructions.
 - 6. Mechanically fasten side laps of adjacent deck units between supports, at intervals not exceeding 36 inches o.c., using self-tapping No. 8 or larger machine screws.
 - 7. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 psf at eave overhang and 30 psf for other roof areas.
- I. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.
- J. Reinforcement at Openings: if shown on the Drawings, provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.
- K. Hanger Slots or Clips: If shown on the Drawings, provide UL-approved punched hanger

slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

1. Hanger clips designed to clip over male side lap joints of floor deck units may be used instead of hanger slots.
 2. Locate slots or clips at not more than 14 inches o.c. in both directions, not over 9 inches from walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.
 3. Provide manufacturer's standard hanger attachment devices.
- L. Joint Covers: If shown on Drawings, provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.
- M. Roof Sump Pans: If shown on Drawings, place roof sump pans over openings provided in roof decking and weld to top decking surface. Space welds not more than 12 inches o.c. with at least one weld at each corner.
- N. Shear Connectors: If shown on Drawings, weld shear connectors to supports through decking units in accordance with manufacturer's instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.
- O. Closure Strips: If shown on Drawings, provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld into position to provide a complete decking installation.
1. Provide flexible closure strips instead of metal closures, at Contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with manufacturer's instructions.
- P. Touch-Up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.
1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
 2. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.
- Q. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.
- R. Touch-Up Painting: Cleaning and touch-up painting of field welds, abraded areas, and rust spots, as required after erection and before proceeding with field painting, is included in Division 09 under "Painting".

END OF SECTION

SECTION 05400
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior wall framing (Delegated design. See Performance Requirements).
 - 2. Interior wall framing (Delegated design. See Performance Requirements).
 - 3. Exterior soffit framing (Delegated design. See Performance Requirements).
- B. This specification section applies to all references in the contract documents to specification section 05410 as well as section 05400.
- C. Related Sections include the following:
 - 1. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 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 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 multiplied by 0.42 as allowed by IBC for purposes of wall deflection limits.
 - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
 - c. 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 positive and negative wind pressure 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.
 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.

1.4 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). For ladders supported by cold-formed metal framing, the detailing of ladder connections to the cold-formed metal framing shall be clearly indicated on the shop drawings (general contractor shall coordinate loading and connection compatibility between ladder 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).

1.5 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."
- 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 - 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 Design Engineer 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.

- J. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Framing Alliance, or the Steel Stud Manufacturers Association.

1.6 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

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing, by one of the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. California Expanded Metal Products Company.
 - 3. ClarkDietrich Building Systems
 - 4. Consolidated Fabricators Corp.; Building Products Division.
 - 5. Custom Stud, Inc.
 - 6. MarinoWare; a division of Ware Industries.
 - 7. SCAFCO Corporation.
 - 8. Steel Construction Systems.
 - 9. Steeler, Inc.
 - 10. United Metal Products, Inc.
 - 11. Super Stud Building Products, Inc.

2.2 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.

2.3 EXTERIOR 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.
 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. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, 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. Minimum section: as required by design. See drawings for required depth of wall.
- E. 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.
- F. 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.

2.4 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.

2.5 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.

2.6 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.
- 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.

2.7 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.

2.8 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

3.1 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.

3.2 PREPARATION

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

- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed 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.

3.3 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.
- 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.

3.4 EXTERIOR 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 72 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.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

- 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 06001
CARPENTRY

PART I - GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall furnish all labor, materials, tools, equipment and perform all work and services necessary for or incidental to the furnishing and installation, complete, of all rough carpentry as shown on drawings and as specified in accordance with provisions of the Contract Documents, and completely coordinated with that of all other trades.
- B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation shall be furnished and installed as part of this work.
- C. Rough carpentry, Structural Framing, and Finish Carpentry.
- D. Roof Curbs.
- E. Blocking at Roof Openings.
- F. Wood Treatment

1.02 QUALITY ASSURANCE

- A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by National Forest Products Association (NFPA).
- B. When applicable, fabricate cabinetwork and site made finish carpentry items in accordance with recommendations of Quality Standards of Architectural Woodwork Institute (AWI).
- C. AWPA - American Wood Preservers Association Book of Standards
- D. Factory-mark each piece of lumber and plywood to identify type, grade, moisture content, agency providing inspection service, producing mill and other qualities specified. Marking may be omitted if certificate of inspection is provided for each shipment.
- E. Do not use wood treatment materials or processes which will, in any way, bleed through or otherwise adversely affect applied finish materials.
- F. Do not use wood treatment materials or processes which will react with or adversely affect roofing materials.
- G. Requirements of Regulatory Agencies: Fire Hazard Classification: Underwriters' Laboratories, Inc. (UL) for fire-treated lumber and plywood.

1.03 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300.
- B. Indicate dimensioned plans and elevations, large scale details, attachment devices, materials, and other components.
- C. Submit samples under provisions of Section 01300 of standard colors and patterns of plastic laminate for Architect/Engineers selection.
- D. Wood Treatment Data and Fire- Retardant Treatment Data: For information only, submit 2 copies of chemical treatment manufacturer's instructions for proper use of each type of treated material. Indicate by transmittal form that copy of each instruction has been distributed to the Installer.
- E. Dip treatment: For each type specified, include certification by treating plant stating chemical solutions used, submersion period and conformance with specified standards.
- F. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.
- G. For water-borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 15% prior to shipment to project site.
- H. Fire-Retardant Treatment: Include certification by treating plant that treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver shop fabricated carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.
- B. Store indoors, in ventilated areas with a constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

PART 2 - PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

- A. Lumber: PS 20; graded in accordance with established Grading rules; maximum moisture content of 15 percent:
- B. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins and Screws: Medium carbon steel; sized to suit application galvanized for exterior locations, high humidity locations and treated wood; plain finish for other interior locations.
- D. Fasteners: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel.

- E. Framing, blocking, nailers, furring, grounds, stripping and similar members for use as indicated on Drawings.
 - 1. AWPB LP-2 termite and preservative treatment.
- F. Pressure treated wood shall be provided where shown or specified. Kiln dry to 15% moisture content after treating.
- G. Framing, blocking, nailers, furring, grounds, cants, stripping, and similar members:
 - 1. SPIB No. 2 - F. 1400 E. 1,600,000
 - 2. WWPA No. 3 - Equivalent to above
- H. Plywood: Comply with requirements of PS I-66, exterior type, A Grade on exposed faces, and C Grade on concealed faces. Where shown, provide exterior type plywood with medium density overlay exposed faces. **Roof sheathing shall be 5/8 inch exterior Grade Plywood.**
- I. Anchorage and Fastening Materials; Provide items which are non-corrosive when used with pressure treated wood. Select proper type, size, materials and finish for each application. Comply with the following:
 - 1. Nails and Staples: Fed. Spec. FF-N-105
 - 2. Wood Screws: Fed Spec. FF-S-111
Lag Screws and Bolts: Fed. Spec. FF-B-561
 - 3. Bolts and Studs: Fed. Spec. FF-B-575
 - 5. Nuts: Fed. Spec. FF-N-836
 - 6. Washers Fed. Spec. FF-W-92
 - 7. Expansion Shields, Expansion Nails and Drive Screw Devices: Fed. Spec. FF-S-325
 - 8. Toggle Bolts: Fed. Spec. FF-B-5589
 - 9. Bar or Strap Anchors: ASTM A107 carbon steel bars.
 - 10. **NOTE: All fasteners used for pressure treated nailers at roof shall be stainless steel.**

2.02 FINISH CARPENTRY

- A. Hardwood Lumber: Graded in accordance with AWI; maximum moisture content of six percent; of the following species and grades.
LOCATION: Only as indicated on Drawings

<u>Item</u>	<u>Species</u>	<u>Grade</u>
Wood Trim Interior, Millwork,	Red Oak Plain Sawn	Premium
- B. Plywood concealed from view in cabinet construction shall be B-B grade fir or pine. Plywood shall be laminated wood core veneer.
- C. Hardwood Plywood: PS 51- graded in accordance with AWI; wood core material of veneer; lumber; type of bond recommended for application; of the following species, grades and face veneer cuts (specified).
- D. Plastic Laminate: General purpose type; minimum 1/16" thick; installed on 3/4" exterior grade plywood with all edges self-edge. The use of metal trim with plastic laminate installation is prohibited. Color shall be selected by Architect or to match existing.

2.03 WOOD TREATMENT

- A. Preservative Treatment; Where lumber or plywood is specified herein to be treated, comply with applicable requirements of AWPB Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.
- B. Pressure-treat above ground items with water-borne preservatives complying with AWPB LP-2. After treatment, kiln-dry to a maximum moisture content of 15%. Treat indicated items and the following:
 - Wood nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
 - Wood sills, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

2.04 FABRICATION

- A. Fabricate finish carpentry items in accordance with recommendations of AWI. Shop fabricate where possible.
- B. Fit shelves, doors and exposed edges with 3/8" thick matching hardwood edging. Use full length pieces only.
- C. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Corners and joints to be hairline.
- D. Cap exposed plastic laminate edges with materials of same finish and pattern.
- E. Shop assemble cabinetwork and finish carpentry items for delivery to site in sizes easily handled and to ensure passage through building openings.

2.05 PREPARATION OF FINISH CARPENTRY ITEMS AND CABINETWORK FOR FINISHING

- A. Sand work smooth and set exposed nails and screws. Apply wood filler in exposed nail and screw indentations and leave ready to receive site applied finishes. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
- B. Preservative treat surfaces in contact with cementitious materials.
- C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from site dimensions. Prime paint, seal contact surfaces of cutouts.
- D. Refer to Division 9 Sections for final finishing of installed cabinetwork.

PART 3 - EXECUTION

3.01 INSTALLATION OF FINISH CARPENTRY ITEMS AND CABINET WORK

- A. Set and secure finish carpentry items in place rigid, plumb, and square.
- B. Use purpose designed fixture attachments for mounted components.
- C. Countersink nail heads on exposed carpentry work and fill holes.

3.02 INSTALLATION OF ROUGH CARPENTRY AND FRAMING ITEMS

- A. Use only sound, thoroughly seasoned, well-manufactured materials of the longest practical lengths and sizes to minimize jointing. use materials free from warp which cannot be easily corrected by anchoring and attachment. Sort out and discard warped material, and materials with other defects which would impair the quality of work.
- B. Securely attach carpentry work to substrates by anchoring and fastening as shown, and as required by recognized standards, and as required to support applied loading.
- C. Provide washers under bolt heads and nuts in contact with wood.
- D. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
- E. Attachment and Anchorage: Use common wire nails, except as otherwise shown or specified. Use finishing nails for finish work. Do not wax or lubricate fasteners that depend on friction for holding power. Select fasteners of a size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood, pre-drill as required. Do not drive threaded friction type fasteners, turn into place. Tighten bolts and lag screws at installation and re-tighten as required for tight connections before closing in or at completion of work.
- F. Provide wood grounds, nailers, or blocking where required for screening or attachment of other work. Form to shapes shown and cut as required for true line and level or work to be attached.
- G. Backing panels for electrical or telephone equipment shall be fire retardant treated A-C exterior type plywood.

3.03 SHEATHING

- A. Secure roof sheathing perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Use sheathing clips between sheets between roof framing members. **Use recommended fastening devices for metal roof framing members.**

END OF SECTION

SECTION 06410
LAMINATED FINISH CUSTOM CASEWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. **(ALL MILLWORK UNLESS NOTED OTHERWISE.)**
Furnish, deliver, and install all casework as shown on drawings and as specified herein:
Plastic Laminate finished fiberboard constructed casework.
- B. Furnish and install all hardware, fillers, scribes, finished ends, finished backs, counter tops, back splashes, and cutouts required to provide a complete and finished project.
- C. Provide locks where shown on casework drawings or described in equipment lists. *All sink bases shall have locks.*
- D. Inspect and properly adjust all casework and its related hardware. Repair damages, remove and dispose of all packing material, debris, and dirt resulting from casework installation leaving area broom clean.
- E. *For plastic laminate finished cabinets, Contractor shall note that millwork shall meet or exceed **Premium standards for AWI**. Wood grain laminate shall be applied in direction of fine wood furniture.* Vinyl edging must match face laminate or edge laminate shall be installed prior to face laminate.
- F. If not noted otherwise, Contractor is to *assume wood grain laminate which shall be applied in vertical direction of fine wood furniture.*

1.02 WORK IN OTHER SECTIONS

- A. All sinks and fittings, couplings and connectors, piping, traps, supplies, shutoffs, and special plumbing fixtures to meet local codes; all electrical fixtures and devices, conduit, wiring, and connectors; and all fans, blowers, motors, ductwork, and metal grilles not specified as part of casework contract including Installation, connection, and testing of all sinks, fittings, electrical fixtures, providing all rough-ins, mechanical piping, electrical runs, and connections required for a complete project. This supplier shall be responsible for coordinating these items to fit into casework where required.
- B. Blocking, framing, and reinforcement in walls, ceilings, and floors for anchoring of cabinets and trim.
- C. General millwork and wood trim items.
- D. Locks master keyed to room doors and other special locks other than cabinet locks specified herein.
- E. Vinyl base molding when not specified as part of casework contract.

- F. *Where Solid Surface and Engineered Stone are specified under 06650, this supplier is to coordinate work with that section.*

1.03 QUALIFICATIONS

- A. The casework shall conform to configuration, arrangement, design, material quality, joinery, panel thickness, and surfacing of that specified and shown on drawings.
- B. Manufacturers requesting approval shall submit samples with cutaways showing cabinet construction if requested, joinery, drawer and door construction, hardware, and materials; along with catalogs and specification in order that accurate evaluations can be made. Samples may be impounded for the duration of contract to insure construction specification compliance.
- C. Work in this section shall comply with the specified grade(s) of work and section (s) of the current edition of the Architectural Woodwork Institute Quality Standards.
1. Work in this section shall be performed by a firm certified by the Architectural Woodwork Institute (AWI) Quality Certification Program and shall be certified as meeting the referenced standard under the full terms and conditions of the AWI Quality Certification Program.

1.04 SUBMITTALS

- A. Shop drawings shall be submitted for approval according to Section 01600. Drawings shall consist of all elevations, sections and plans as necessary to indicate arrangement and relation to adjacent work and equipment. Centerline of service requirements shall be noted for use by other trades.
- B. Color samples shall be submitted for selection and coordination at time of contract award. Samples of actual material and colors shall be available as required.

1.05 COLOR SELECTION

- A. A minimum of thirty colors and patterns shall be available as standard selections for cabinet exteriors, door and drawer colors. See 06001 for manufacturers.
- B. All exposed exterior cabinet body edges and door and drawer edges shall be color matched with cabinet sides, doors, and drawer fronts.

PART 2 - PRODUCTS

2.01 CABINET MATERIALS

- A. Cabinets shall be constructed 45pcf minimum density (medium) fiberboard except that all countertops and shelves at sink bases shall be 3/4" plywood with exterior rated glue. PARTICLE BOARD IS NOT ACCEPTABLE. See component description for thickness.
- B. Doors shall be laminated *both sides* with 1/32 inch high pressure plastic laminate.
- C. All exposed exterior surfaces should be laminate with 1/32 inch plastic laminate.
- D. All exposed edges of cabinets, doors and drawer edges shall be **3mm minimum vinyl** in colors *as selected by Architect*.

- E. All countertop (counter) edges shall be **3mm "T-Molding"** equal to **#4542** or **#4245** (as selected by Architect) by Charter Industries with a minimum of 16 stock colors. Color to be selected by Architect.
- F. All framing members should be laminate on both sides and exposed edges.
- G. All exposed interior surfaces should be laminated with .025 inch, high pressure plastic laminate cabinet liner including shelves and dividers or shall be constructed of thermally fused Melamine surfaced material meeting NEMA LD3-1991-GP28 and American Laminators Assoc. Standards 1988.
- H. Drawers: Drawer fronts should have 1/32 inch plastic laminate on exposed face of fiberboard board core with .025 inch plastic laminate liner on interior surface. Drawer front edges should be edged with vinyl to match face laminate. Drawer body should be laminated on both sides with .025 inch plastic laminate liner (see G) with top edges receiving edge trim. Drawer bottoms should be laminated with .025 inch plastic laminate liner (see G).
- I. Plastic Laminate will be selected from Nevamar, Wilson Art, Formica at designers discretion.

2.02 HARDWARE

- A. Hinges: shall be Blum Module 170 degree concealed, European style, 170 degree opening (90 degree opening where adjacent to wall), self-closing. Products by Hafele are approved for bidding.
- B. Pulls shall be cast brass, accurately positioned on door and drawer front with machine screws. Pulls shall be Stanley #4484. Finish shall be brushed aluminum. Equal pulls by Hafele are approved for bidding.
- C. Drawers and glide out shelves shall be suspended on nylon roller steel slides to insure quiet, smooth operation. Slides shall have 100 pound load rating (minimum) with built in drawer stop and self close feature in the last one inch of travel. Glides shall be full extension K & V 8400 typical or Hafele Accuride.
- D. File drawers shall be suspended on full extension steel slides with ball bearings and a 100 pound minimum load rating, equal to K&V 8400 or Hafele Accuride. In addition file drawers shall be provided with hanging frames. Hanging file rail shall be mounted on drawer sides manufactured by CPF. An equivalent framing system by KineFlex is acceptable. **Submit shop Drawing for approval indicating details, manufacturer, etc.**
- E. Locks will be provided where shown on drawings or cabinet description:
Locks shall be cylinder type, die cast, with five disc tumbler mechanism. Each lock shall be provided with 3 milled brass keys. Provide option of selecting keyed alike, keyed different, and master keyed locks; Knape Vogt 986, Corbin 02067, Yale 9730 - see plan notes for more specifics.
- F. Adjustable shelf standards and supports shall be Stanley 798/799, Knape & Vogt 255 or Grant 120/121. *Line Boring with metal support clips is acceptable.*
- H. Grommets shall be solid plastic with cord slot cover (equal to Mockeet) with at least 8 colors to choose from.
- I. K&V or Hafele Glass Window Tracks where noted. Refer also to Section 11132 for Television and Monitor Equipment. *This contractor shall coordinate installation of these devices into the millwork.*

Confirm supplier with general contractor.

- J. Counter supports shall be equal to Rakks EH Series for Flush Mounted Installation as manufactured by Rangine Corporation, Needham, Massachusetts 02494, Phone (781) 455-8700. *Furnish all accessories for complete installation. Escutcheons Plates required. Install per manufacturers printed instructions & recommendations.* Finish shall be Clear Anodized Aluminum. Furnish and install anodized aluminum **face plates** to trim around supports at wall intersections. Spacing of brackets shall be **32" or less**. Counters shall overhang supports a maximum of 5". Add additional wood blocking inside metal studs as recommended by manufacturer. Provide all components and accessories as required for a complete installation and install per manufacturers printed instructions and recommendations.

NOTE: These counter supports are for **any counters spanning over 32"**.

2.03 WORK SURFACES & DECORATIVE SURFACES

- A. Plastic laminate counter tops shall be surfaced with general purpose .050 thick plastic laminate meeting NEM spec. LD3-1975 GP-50. Counter top cores shall be 3/4" exterior grade AB plywood. All exposed edges which are not **solid surface or engineered quartz** shall be as specified above.
- B. Back splashes and end splashes are to be provided as indicated on drawings and shall be surfaced with same laminate as top with coved transition unless noted otherwise. *Unless noted otherwise back splashes shall be full height to bottom of cabinet.* Where 4" or 6" back splash are shown core shall be 3/4" exterior plywood (edging to be 1mm). All counters with sinks shall have back splashes. Provide backer for cove from top to splash.
- C. **Refer to Section 06650 - Solid Polymer Fabrications (solid surface)** where noted on drawings or schedules. Coordinate installation.

2.04 COMPONENT DETAILS

- A. Corner joints incorporated in cabinets shall be equal to dowel pin construction and must be factory glued and clamped under pressure to assure rigid load bearing corner joints.
- B. Cabinet ends shall be 3/4 inch thick panels of balanced construction, precision bored for dowel pins installed in horizontal cabinet members. Base and tall units shall have one piece end panels continuous to floor for added load capabilities. Unexposed ends shall have laminate backing sheet.
- C. Cabinet bottoms and tops shall be 3/4 inch thick panels of balanced construction for base and tall units.
- D. Kick panels shall be four inch high, set back from the cabinets front edge and mechanically fastened to the cabinet bottom and ends, becoming an integral part of the cabinet structure.
- E. Back panels shall be set 3/8 inch thick set in cabinet side grooves with melamine finish. Wall cabinet backs shall also set in top and bottom shelf grooves.

- F. Finished exposed backs of fixed cabinets are to be 3/4 inch thick panels of balanced construction surfaces.
- G. Frame rails between drawers must be full length, 3/4 inch thick x 3-1/2 inch wide, dowel pinned, and fastened into cabinet sides.
- H. Hang rails shall be provided in wall cabinets in the upper back corner for mounting units to wall.
- I. Drawers shall be full box design with a separate front. Drawer sides and end must be constructed of 5/8 inch high density fiberboard. Bottoms shall be 1/4 inch thickness. Corner joints shall be interlocking dowel pin design. Hardwood dowel pins eight mm diameter shall be inserted into drawer ends and fitted into matching hole patterns in drawer sides. Bottoms must be trapped in grooves all four sides. All joints shall be glued and bottoms shall have additional mechanical fasteners. Drawers shall be suspended on slides. Seal drawer joints to match finish & make them leakproof.
- J. Solid hinged doors shall be 3/4 inch thick material of balanced construction. Doors 48 inches and less in height shall have two hinges per door. Doors above 48 inches in height, but not exceeding 63 inches in height, shall have three hinges per door, and all doors in excess of 63 inches in height shall have four hinges per door. Doors over 48" shall be 1" thick. Adjacent doors shall match in thickness.
- K. Adjustable shelves less than 36 inches in length shall be 3/4 inches thick. Shelves 36 inches long and over, and all adjustable shelves in wall cabinets and bookcases, shall be one inch thick. All adjustable shelves shall be constructed of 50 pound density fiber board.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify adequacy of backing and support framing before proceeding.
- B. Set and secure casework in place rigid, plumb, and level. Permanently fix cabinet and counter bases to floor using appropriate angles and anchorages.
- C. Use purpose designed fixture attachments at concealed locations for wall mounted components.
- D. Carefully scribe casework which is against other building materials, leaving gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinet and counter bases to walls using appropriate angles and anchorages.
- F. Counter sink anchorage devices at exposed locations used to wall mount components, and conceal with solid plugs of species to match surrounding wood. Finish flush with surrounding surfaces.
- G. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units, counter tops and overhead cabinets.

3.03 ADJUSTING AND CLEANING

- A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures.

END OF SECTION

SECTION 06610
Shower Surrounds & Solid Surface Receptors

PART 1 – GENERAL

1.01 SUMMARY

- A. Shower Receptors and Shower Systems

1.02 REFERENCES

- A. American National Standards Institute (ANSI)

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide shower receptors and shower systems that conform to the following requirements of regulatory agencies and the quality control of Inpro® Corporation.
 - 1. Provide shower receptors and shower systems that conform to ANSI Z124.1.2-2005 when tested for workmanship and finish, structural integrity and material characteristics.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's printed product data for each type of shower receptor and shower system specified.
- B. Samples: Verification samples minimum of 3" x 3" samples indicating color and pattern.
- C. Manufacturer's Installation Instruction: Printed installation instructions for shower receptors and shower systems.

1.05 DELIVERY, STORAGE, & HANDLING

- A. Deliver materials in unopened factory packaging to the jobsite.
- B. Inspect materials at delivery to assure that specified products have been received.
- C. Store in original packaging in an interior climate-controlled location away from direct sunlight.

1.06 PROJECT CONDITIONS

- A. Environmental Requirements: Products must be installed in an interior climate-controlled environment.

1.07 WARRANTY

- A. Standard Prism™ Solid Surface Limited 10 Year Warranty against material and manufacturing defects.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. Basis-Of-Design Product- For the purpose of establishing quality, type & design, products by InPro Corporation, Endurant Washroom Systems
PO Box 406 Muskego, WI 53150 USA; Telephone: 800.222.5556, Fax: 888.715.8407, Website: www.inprocorp.com have been specified.
- B. Substitutions: Per Instructions to Bidders and Section 01600.
 - 1. Submit comparable products of one of the following for approval by architect:
 - a. Insert name of manufacturer of comparable product.
 - b. Submit requests for substitution in accordance with Instructions to Bidders and Section 01600.

2.02 MANUFACTURED UNITS

- A. Shower receptors and shower systems
 - 1. Prism™ Solid Surface Shower Systems
 - a. Receptor Size,
 - 1) 36" x 36", Systems include: Drain Assembly, back, right, and left wall panels
 - 2) 36" x 42", Systems include: Drain Assembly, back, right, and left wall panels.
 - b. Wall:
 - 1) Wall Height Prism™ Solid Surface
 - a) Up to 96"
 - c. Shower Drain:
 - 1) Shower Drain assembly shall be Oatey number 42150, Brass, No-caulk, Drain w/Stainless Steel (standard) or Brass Strainer. Drain body is sealed to shower base with a fiber and rubber washer. Drain is secured to 2", 40 DWV pipe with a mechanically compressed gasket that does not require caulking. Drain top to accommodate 4-1/4" Universal Snap-Tite Strainer.
 - 2. Wall Panels Only
 - a. Custom made to order.
 - 1) Edge Options: Unfinished, Eased, Radius, Beveled.
 - b. Panel options: Provide Prism™ Solid Surface Panels with the following decorative options as selected by Architect.
 - 1) Groove width, Groove style, cutting depth
 - a) 1/8", V-groove, .060" deep
 - b) 3/16", Ball Nose, .050" deep
 - c) 1/8", Ball Nose, .015" deep, double lines, 2.75"O.C. (Bead Board Only)

2.03 ACCESSORIES

- A. Trim
 - 1. Inside Corner Wedge Molding, 15/16"
 - 2. Inside Corner Molding - L-Shaped, 1" x 1"
 - 3. Batten Strip, 2 1/2"
 - 4. Outside Corner Molding - L-Shaped 1" x 1"
 - 5. Perimeter Trim, 2 1/2" x 1/2"
 - 6. Outside Corner Perimeter Trim, 2 1/2" x 1"
 - 7. Panel Molding, 2 1/4" x 13/16"
 - 8. Wall Base, 5" x 1/2"

- 9. Beveled Edge Trim, 1 3/16" x 1/2"
- B. Recessed Dishes
 - 1. Recessed Toiletry Shelf, 12" x 18"
 - 2. Recessed Toiletry Niche, 10" x 16"
 - 3. Recessed Toiletry Shelf, 8" x 16"
- C. Solid Surface Bonding Adhesive
- D. Adhesive Cartridge Dispenser
- E. Adhesive Mixing Tips
- F. Silicone Adhesive/Sealant
- G. Pick Resistant Color Coordinated Caulk (Sealant)

2.04 MATERIALS

- A. Prism™ Solid Surface: Shower wall panels shall be manufactured from polyester/acrylic blended resins with natural filler material.

2.05 FINISHES

- A. Select color from Inpro® Corporation Prism™ Solid Surface color palette.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions in which shower receptors and shower systems will be installed.

3.02 PREPARATION

- A. General: Prior to installation, clean area to remove dust, debris, and loose particles.

3.03 INSTALLATION

- A. General: Install components plumb and level, scribe adjacent finishes, in accordance with approved shop drawings and recommended installation instructions.

3.04 CLEANING

- A. At completion of the installation, clean surfaces in accordance with the manufacturer's clean-up and maintenance instructions.

End of Section

SECTION 06650
SOLID POLYMER FABRICATIONS
(Solid Surface)

PART I. GENERAL

1.01 Description

- A. Work described in this section includes counter tops edges, thresholds and backsplashes where noted.
- B. *Assume Series F for Corian or equivalent **if not indicated on Room Color Schedule.***

1.02 REFERENCES

- A. Applicable Standards: Standards of the following, as referenced herein:
 - 1. American National Standards Institute (ANSI)
 - 2. American Society for Testing and Materials (ASTM)
 - 3. National Electrical Manufacturers Association (NEMA)
 - 4. Federal Specifications (FS)

1.03 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 2" x 2" (50 mm x 50 mm) samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.
- C. Product description, fabrication information and compliance with specified performance requirements.
- D. Care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.04 QUALITY ASSURANCE

- A. Allowable tolerances:
 - 1. Variation in component size: $\pm 1/8"$ (3 mm).
 - 2. Location of openings: $\pm 1/8"$ (3 mm) from indicated location.
- B. Solid Surfacing must be applied by a certified installer. Provide installers certification prior to start of work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver components to a project site until areas are ready for installation. Store components indoors prior to installation.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

1.07 CARE & MAINTENANCE

- A. Provide care and maintenance information for the owner.

II. PRODUCTS

2.01 SOLID POLYMER FABRICATIONS

- A. Specified product:
CORIAN® SURFACES, F Color, Matt Finish from The DuPont Company, Formica brand equivalents are approved for bidding.
- B. Material: Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
1. Material shall have minimum physical and performance properties specified in the following Section U.
 2. Superficial damage to a depth of 0.010" (.25 mm) shall be repairable by sanding and polishing.
- C. Counter tops: 1/2" (13 mm) thick solid surface material adhesively joined with inconspicuous seams; edge details as specified on the Architect's Drawings (1 1/2" thick, reverse bevel); color as listed on color schedule or to be selected from range of colors stipulated above.
- D. Surfaces to be unaffected by Class I reagents and repairable after exposure to Class II reagents.
- E. At areas where exposed to cold, use Technical Bulletins: CTDC 119, 124, 125.
1. Make cutouts to templates furnished by the cold appliance manufacturer.
 2. Reinforce joints and cutouts as recommended by the surfacing manufacturer.
 3. Provide insulation between CORIAN and adjacent cold pans.
 4. Thermally isolate hot applications from cold.
- F. At areas where exposed to hot, use Technical Bulletins: CTDC-119, 124, 125.
1. Provide expansion joints in counter top as detailed on the Architect's Drawings or required by manufacturer for specific application.
 2. Make cutouts to templates furnished by the hot appliance manufacturer.
 3. Reinforce joints and cutouts as recommended by the surfacing manufacturer.
 4. Thermally isolate hot applications from cold.
- G. Performance characteristics:

PROPERTY	REQUIREMENT	TEST PROCEDURE
Tensile Strength	6000 psi	ASTM D 638
Tensile Modulus	1.5 x 10 ⁶ PSI	ASTM D 638
Flexural Strength	7890 psi	ASTM D 790

Flexural Modulus	1.4 x 10 ⁶ PSI	ASTM D 790
Elongation	0.4%	ASTM D 638
Strain at Break	0.81%	ASTM D 638
Work to Break	2.48 in. lbs.	ASTM D 638
Hardness	94 Rockwell "M" Scale 56 Barcol Impressor	ASTM D 785
Thermal Expansion	3.02 x 10 ⁻⁶ in/in/°C	ASTM D 696
	1.80 x 10 ⁻⁶ in/in/°F	
Thermal Conductivity	7.0 Btu/hr/sq ft °F	DuPont Test
Specific Heat	0.2935 + (0.001 % °C) pcu/lb °C	DuPont Test
Volumetric Heat Capacity	0.33 Btu/lb °F	DuPont Test
Gloss (60 Gardner)	5-80 (matte-polished)	NEMA LD 3-3.15
Color Stability	No Change - 200 hrs	NEMA LD 3-3.10
Wear and Cleanability	Passes	ANSI Z 124.3
Abrasion Resistance	No loss of pattern Wt loss (1,000 cycles) - 0.2 gm Wear (10,000 cycles) - .008"	NEMA LD 3-3.10
Boiling Water Surface Resistance	No Change	NEMA LD 3-3.05
High Temperature Resistance	No Change	NEMA LD 3-3.06
Conductive Heat Resistance	No Change	NEMA LD 3-3.08
Impact Resistance Notched Izod Gardner	.28 ft. lbs/in. of notch solid colors 9.3 ft. lbs particulate colors 13.3 ft. lbs	ASTM D 256 (Method A) ASTM D 3029
Ball Drop 1/4" (6 mm) sheet 1/2" (13 mm) sheet 3/4" (19 mm) sheet	>36" w 1/2 lb ball, no failure >144" w 1/2 lb ball, no failure >204" w 1/2 lb ball, no failure	NEMA LD 3-3.03
Bowls (Point Impact)	No cracks or chips	ANSI Z124.3 and 124.6
Stain Resistance	Passes	ANSI Z124.3
	Rating - 41 (modified*)	ANSI Z124.3(modified)
Weatherability	No Change - 1000 hours	ASTM D 1499
Fungi and Bacteria	No Attack	ASTM G 21, G 22
Specific Gravity solid colors particulate colors	1.8 1.69	
Material Weight solid colors particulate colors	1/4" (6 mm), 1/2" (13 mm), 3/4" (19 mm) 2.35 4.7 7.0 lbs/sq. ft 2.1 4.2 6.2 lbs/sq. ft.	
Water Absorption 3/4" (12 mm) sheet 1/4" (6 mm) sheet	After 24 hrs Long Term 0.04% 0.94% 0.09% 0.8%	ASTM D 570
Flammability solid colors Flame Spread Smoke Developed Class Rating	1/4"(6 mm) 1/2"(13mm) 3/4" (19mm) 25(15) 5 5 25(20) 10 15 1 1 1	ASTM E84

particulate colors Flame Spread Smoke Developed Class Rating	20 5 1	15 25 1	15 30 1	
Oxygen Index	0.357			ASTM D 2863
Pittsburgh Protocol Toxicity (as used by NY State)	solid colors 99 grams particulate colors 67 grams			"LC 50" Test
Coefficient of Friction	0.189 static 0.171 dynamic			DuPont Test TD-511-A
Arc Resistance	190 seconds, no track 60 seconds, rerun, no track			ASTM D 495
Dielectric Strength solid colors particulate colors	275 volts/0.001" 263 volts/0.001"			ASTM D 149
Dielectric Constant solid colors particulate colors	4.96 at 100 Hz 4.46 at 100 Hz			ASTM D 150
Dissipation Factor solid colors particulate colors	0.0698 at 100 Hz 0.077 at 100 Hz			ASTM D150
Surface Conductivity solid colors	5.0 x 10 ¹⁶ Mho			DuPont Test TD-533-A or equivalent

Volume Conductivity solid colors	4.7 x 10 ¹⁶ Mho	DuPont Test TD-533-A or equivalent
Volume Resistivity solid colors particulate colors	4.2 Ohms cm x 10 ⁻¹⁴ 10.0 Ohms cm x 10 ⁻¹⁴	ASTM D 257
Electrical Charge Relaxation Time solid colors	560 seconds	PTMS 101B, MIL B-81705
Heat of Combustion	2.20 cal/gm	Oxygen bomb (calorimeter method)

2.02 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond. (Technical Bulletin: CTDC 102)
- B. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A 136.1-1967 UL® listed. (Technical Bulletin: CTDC 102)
- C. Sealant: Manufacturer's standard mildew-resistant, FDA/UL® recognized silicone sealant in color matching or clear formulations. (Technical Bulletin: 102, 127)

2.03 FABRICATION

- A. Fabrications to be performed by a manufacturer certified fabricator/installer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements. (Technical Bulletin: CTDC-117)

- C. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" (50 mm) wide reinforcing strip of solid surface material under each joint. [Technical Bulletins: CTDC-124, 129, 134]
- D. Provide holes and cutouts for plumbing and bath accessories as indicated on the drawings.
- E. Route and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- F. Matt Finish: All surfaces shall have uniform finish. [Technical Bulletins:CTDC100, 123, 132] Matte, with a gloss rating of 5 - 20.
- G. Backsplashes (and Aprons where noted): Fabricate straight backsplashes using [1/2" (13 mm) matching solid surface material. Fabricate in shop or field. [Technical Bulletin: CTDC-112] Set backsplash on counter top and seal joint with matching sealant.

III. EXECUTION

3.02 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Adhere top mount sinks/bowls to counter tops using manufacturer recommended adhesives and color-matched silicone sealant. Where bowls are solid surface material, adhere as recommended by manufacturer.
- E. Provide back splashes and end splashes as indicated on the drawings. Adhere to counter tops using manufacturer's standard color-matched silicone sealant.
- F. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- G. Make plumbing connections to sinks in accordance with Division 15. Mechanical.
- H. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction.
- I. Fabricator/Installer is to provide the manufacturer's Commercial Care and Maintenance video, review maintenance procedures and the provide warranty upon completion of project.

End of Section

**SECTION 07155
FLUID-APPLIED MEMBRANE AIR BARRIERS (AWB)**

PART 1: GENERAL

1.1. GENERAL REQUIREMENTS

- A. The General Conditions, Supplementary Conditions, Instructions to Bidders, and Division 01- General Requirements shall be read in conjunction with and govern this section.
- B. The Specification shall be read as a whole by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the Subcontractor the extent of their Work.

1.2. SUMMARY

- A. This Section includes requirements for supplying labor, materials, tools, and equipment to complete the Work as shown on the Drawings Architectural Division as specified herein including, but not limited to, the following:
 - 1. Adhesives/Primers
 - 2. Fluid Applied, Vapor Permeable Air & Water Barrier Membrane
 - 3. Transition Membranes
 - 4. Sealant
 - 5. Thru-wall flashing
 - 6. Insulation Adhesive (Optional)

1.3. RELATED REQUIREMENTS

- A. DIVISION 03 – Concrete Section 03300 Cast-In-Place Concrete
- B. DIVISION 04 – Masonry Section 04221 – Concrete Masonry Building
- C. DIVISION 04 – Masonry Section 04300 – Masonry and Architectural Cast Stone Sills, Bands, and Trim
- D. DIVISION 07 – Thermal and Moisture Protection Section 07155 – Damp proofing
- E. DIVISION 07 – Thermal and Moisture Protection Section 07600 - Sheet Metal Flashing
- F. DIVISION 07 – Thermal and Moisture Protection Section 07951 – Caulking and Sealants
- G. DIVISION 09 – Finishes Section 09260 Gypsum Board Systems

1.4. ALTERNATES

- A. Primary membranes defined as Water Resistive Coatings are only considered acceptable substitutions when installed in conjunction with EIFS in accordance with ICC-ES AC 212 and are not considered acceptable substitutions for wall assemblies with alternate claddings.
- B. Submit requests for alternates in accordance with documents.

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- C. Alternate submission format to include:
 - 1. Evidence that alternate materials meet or exceed performance characteristics of product requirements and documentation from an approved independent testing laboratory certifying that the performance of the system including auxiliary components exceed the requirements of the local building code.
 - 2. References clearly indicating that the Air Barrier Manufacturer has successfully completed projects of similar scope and nature on an annual basis for a minimum of ten (10) years.
 - 3. Air Barrier Manufacturer's guide specification.
 - 4. Air Barrier Manufacturer's complete set of technical data sheets for assembly.
 - 5. Air Barrier Manufacturer's complete set of details for assembly.
 - 6. Product certification that the assembly components are supplied and warranted by single source Air Barrier Manufacturer.
 - 7. Sample warranty as specified.
- D. Submit requests for alternates to this specification a minimum of ten (10) working days prior to bid date. Include a list of twenty-five (25) projects executed over the past five (5) years.
- E. Acceptable alternates will be confirmed by addendum. Substitute materials not approved in writing prior to tender closing shall not be permitted for use on this project.

1.5. REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AMMA 2400-02, Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D412, Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers - Tension
 - 2. ASTM D471, Standard Test Method for Rubber Property - Effect of Liquids
 - 3. ASTM D1970, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 4. ASTM D2243, Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
 - 5. ASTM D5590, Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
 - 6. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
 - 7. ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials
 - 8. ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - 9. ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
 - 10. ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 - 11. ASTM E1354, Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
 - 12. ASTM E1677, Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls

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13. ASTM E2112, Standard Practice for Installation of Exterior Windows, Doors and Skylights
14. ASTM E2178, Standard Test Method for Air Permeance of Building Materials
15. ASTM E2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.6. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate the Work of this Section with the installation of exterior substrate. Sequence Work so that installation of fluid-applied air barrier coincides with installation of substrate preparation without causing delay to the Work.
- B. Pre-installation meetings:
 1. When required, and with prior notice, an Air Barrier Manufacturer representative will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the assembly.

1.7. SUBMITTALS

- A. Provide the following requested information in accordance with Section 01300 Submittals.
- B. Action Submittals:
 1. Product Data:
 - a. Air Barrier Manufacturer's guide specification.
 - b. Air Barrier Manufacturer's complete set of technical data sheets for assembly.
 - c. Air Barrier Manufacturer's complete set of standard detail drawings.
 2. Certificates:
 - a. Product certification that the assembly components are supplied and warranted by single source Air Barrier Manufacturer.
 - b. Statement that installing contractor is authorized by Air Barrier Manufacturer to complete Work as specified.
 3. Warranty:
 - a. Sample warranty as specified.

1.8. QUALITY ASSURANCE

- A. Single Source Responsibility:
 1. Obtain fluid-applied membrane air barrier, transition membranes, air barrier sealants, primers, mastics, and adhesives from a single Air Barrier Manufacturer regularly engaged in the manufacturing and supply of the specified products.
 2. Contactor to verify product compliance with federal, state, and local regulations controlling use of Volatile Organic Compounds (VOC).
- B. Manufacturer Qualifications:
 1. Air Barrier Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:
 - a. Air Barrier Manufacturer must not issue warranties for terms longer than they have been manufacturing and supplying specified products for similar scope of Work.
- C. Installer Qualifications:
 1. Perform Work in accordance with Air Barrier Manufacturer published literature and as specified in this section.

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2. Maintain one (1) copy of Air Barrier Manufacturer's instructions on site.
3. At all times during the execution of the Work allow access to site by the Air Barrier Manufacturer representative.
4. If meeting with Air Barrier Manufacturer during project construction, contact Air Barrier Manufacturer a minimum of two weeks prior to schedule meeting.

1.9. DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials:
 1. Materials shall be delivered to the jobsite in undamaged and clearly marked containers indicating the name of the Air Barrier Manufacturer and product.
- B. Storage of Materials:
 1. Store materials as recommended by Air Barrier Manufacturer and conforming to applicable safety regulatory agencies. Refer to all applicable data including but not limited to MSDS sheets, Product Data sheets, product labels, and specific instructions for personal protection.
 2. Keep solvents away from open flame or excessive heat.
 3. Products should be stored in closed containers.
 4. Store rolled materials on end in original packaging.
 5. Protect rolls from direct sunlight until ready for use.
 6. Refer to Air Barrier Manufacturer published literature.
- C. Handling:
 1. Refer to Air Barrier Manufacturer published literature.

1.10. SITE CONDITIONS

- A. Environmental Requirements:
 1. No Work shall be performed during rain or inclement weather.
 2. No Work shall be performed on frost or wet covered surfaces.
- B. Protection:
 1. Cap and protect exposed back-up walls against wet weather conditions during and after application of membrane.
- C. Ensure all preparation Work is completed prior to installing fluid-applied membrane air barrier.

1.11. WARRANTY

- A. Manufacturer Material Warranty:
 1. Provide Air Barrier Manufacturer's standard material warranty.

PART 2: PRODUCTS

2.1. MATERIALS MANUFACTURER

- A. Components and auxiliary materials must be obtained as a single-source from the assembly Air Barrier Manufacturer to ensure total system compatibility and integrity.
- B. Acceptable Manufacturers:
 1. Henry Company
999 N. Sepulveda Blvd. Suite 800
El Segundo, CA 90245

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(800) 486-1278

www.Henry.com

2. W.R. Meadows – Air-Shield AMP
3. Substitutions: Under provisions of Section 01600 and Instructions to Bidders

2.2. MATERIALS

- A. Primary Fluid-Applied Membrane Air Barrier (Basis of Design):
 1. One-component, water-based, elastomeric emulsion membrane, designed to provide a vapor permeable air and water barrier when applied above-grade wall assemblies, having the following properties:
 - a. Basis of Design Product: Air-Bloc 17MR
 - b. Color: Graphite
 - c. Solids Content:
 1. By Weight: 63%
 2. By Volume: 53%
 - d. Service Temperature:
 1. Low Temperature: -40 degrees F (-40 degrees C)
 2. High Temperature: +180 degrees F (+80 degrees C)
 - e. Application Temperature:
 1. Low Temperature: +20 degrees F (-6 degrees C)
 2. High Temperature: +122 degrees F (+50 degrees C)
 - f. Tensile Strength (ASTM D412): 104 psi (717 kPa)
 - g. Elongation (ASTM D412): 420%
 - h. Low Temperature Flexibility @ -22 degrees F (-30 degrees C) (ASTM D1970): Pass
 - i. Freeze-Thaw Resistance (ASTM D2243): Pass; 10 cycles
 - j. Nail Sealability (ASTM D1970): Pass
 - k. VOC Content: 100 grams/liter max.
 - l. Water Absorption (ASTM D471, modified): 5.6%
 - m. Water Vapor Permeance (ASTM E96 B) @ 40 mils nominal dry film: 14 perms
 - n. Air Permeability:
 1. Assembly Air Leakage (ASTM E2357): Pass
 2. Building Material (ASTM E2178): 0.0001 cfm/ft² (0.0005 L/s.m²)
 - o. Chemical Resistance: Resists salt solutions, mild acids and alkalis. Non-resistant to oils, grease or solvents
 - p. Flame Spread/Smoke Development (ASTM E84): 10/15
 - q. Resistance to Mold, Mildew, and Fungal Growth (ASTM D5590): No growth
- B. Auxiliary Materials
 1. Transition Membranes:
 - a. Liquid applied flashings:
 1. Moisture-curing one component elastomeric liquid applied flashing membrane using a highly advanced STPe (Silyl-Terminated Polyether) polymer, having the following properties:
 - a. Basis of Design Product: Air-Bloc LF
 - b. Color: Blue
 - c. Air Leakage (ASTM E2178): <0.004 L/s/m² @ 75Pa
 - d. Water Vapor Permeance (ASTM E96, Method B): 21.8 perms @25 mils
 - e. Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - f. Water Resistance (AC212/ASTM D2247): Pass
 - g. Nail Sealability (AMMA 711): Pass
 - h. Surface Burning Characteristics (ASTM E84):
 1. Class A

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2. Flame Spread/Smoke Development (ASTM E84): 20/5
 - i. Tensile Strength (ASTM D412): 132 psi
 - j. Elongation (ASTM D412): 264%
 - b. Self-Adhering flashings:
 1. Non-vapor permeable, self-adhered water resistive air and vapor barrier membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue engineered thermoplastic film, having the following properties:
 - a. Basis of Design Product: Blueskin SA
 - b. Color: Blue
 - c. Water Vapor Permeance (ASTM E96, Method A): .86 perms
 - d. Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - e. Air Leakage (ASTM E2178): <0.0005 L/s/m² @ 75Pa
 - f. Water Tightness (CAN/CGSB-37.58-M86): Pass.
 - g. Nail Sealability (ASTM D1970): Pass.
 - h. Tensile Strength:
 1. Membrane (ASTM D412-modified): 500 psi minimum
 2. Film (ASTM D828): 5000 psi minimum
 - i. Elongation (ASTM D412-modified): 200% minimum
 2. Sheathing Joint Membranes:
 - a. Vapor permeable, self-adhered water resistive air barrier membrane consisting of an engineered film and patented, permeable adhesive technology with split-back poly-release film, having the following properties:
 1. Basis of Design Product: Blueskin VP160
 2. Color: Blue
 3. Air Leakage (ASTM E2178): <0.02 L/s/m² @ 75Pa
 4. Water Vapor Permeance (ASTM E96, Method A): 29 perms
 5. Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 6. Resistance to Water Penetration (ICC-ES AC 38): Pass.
 7. Nail Sealability (ASTM D1970): Pass
 8. Surface Burning Characteristics (ASTM E84):
 - a. Class A
 - b. Flame Spread/Smoke Development (ASTM E84): 0/105
 9. Tensile Strength (ASTM D828): 182N MD/129N CD
 10. Cycling and Elongation (ICC-ES AC48): Pass
 - b. Contact Air Barrier Manufacturer for a complete list of authorized transition membranes.
 3. Adhesives and Primers:
 - a. Spray adhesive, and having the following properties:
 1. Basis of Design Product: Blueskin Spray Prep
 2. Color: Clear amber
 3. Solids Content (By Weight): 35%
 4. Aerosol
 - b. Synthetic rubber based adhesive type, quick setting, having the following properties:
 1. Basis of Design Product: Blueskin Adhesive
 2. Color: Blue.
 3. Solids Content (By Weight): 35%.
 4. Solvent based: Maximum VOC: 450 g/L
 - c. Polymer emulsion based adhesive type, quick setting, low VOC content, having the following properties:
 1. Basis of Design Product: Blueskin LVC Adhesive
 2. Color: Blue.
 3. Solids Content (By Weight): 40%.
 4. Solvent based: 240 g/L.
 - d. Polymer emulsion based primer for self-adhered membranes, and having the

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following properties:

1. Basis of Design Product: Aquatac Primer
 2. Color: Aqua.
 3. Solids Content (By Weight): 58%.
 4. Water based: Maximum VOC: 50 g/l
4. Sealants:
- a. Building Envelope Sealant:
 1. Moisture cure, medium modulus polymer modified sealing compound, having the following properties:
 - a. Basis of Design Product: HE925 BES Sealant
 - b. Complies with Fed. Spec. TT-S-00230C, Type II, Class A.
 - c. Complies with ASTM C920, Type S, Grade NS, Class 35.
 - d. Elongation: 450 – 550%.
 - e. Remains flexible with aging.
 - b. Sheathing Joint Sealants:
 1. As recommended by Air Barrier Manufacturer
 - c. Contact Air Barrier Manufacturer for a complete list of authorized sealants.
5. Self-Adhesive Thru-Wall Flashing Membrane:
- a. Non-vapor permeable, self-adhered water resistive air and vapor barrier membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue engineered thermoplastic film, having the following properties:
 1. Basis of Design Product: Blueskin TWF
 2. Color: Yellow
 3. High Temperature Stability - Flow Resistance (ASTM D5147): Pass
 4. Air leakage (ASTM E283): 0.005 L/s.m² @ 75 Pa
 5. Water vapor permeance (ASTM E96, Method B): 0.03 perms
 6. Low temperature flexibility (CGSB 37-GP-56M): Pass
- C. Insulation Adhesive:
1. Synthetic rubber base compound having the following characteristics:
 - a. Basis of Design Product: Air-Bloc 21
 - b. Color: Cream.
 - c. Compatible with air barrier membrane, substrate and insulation materials.
 - d. Long term flexibility (CGSB 71-GP-24M): Pass.
 - e. Chemical resistance: Alkalies, mild acid and salt solutions.

PART 3: EXECUTION

3.1. EXAMINATION

- A. Substrate Conditions:
1. Verify substrates to receive work and surrounding adjacent surfaces are in accordance with Air Barrier Manufacturer published literature prior to installation of fluid applied membrane air barrier assembly.
 2. Sheathing panels must be securely fastened and installed flush to ensure a continuous substrate in accordance with Air Barrier Manufacturer published literature.
 3. Fastener penetrations must be set flush with sheathing and fastened into solid backing.
 4. Mortar joints in concrete block and form tie holes/voids in poured concrete shall be filled, flush, smooth, and allowed to be cured for a minimum of twenty-four (24) hours.

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5. New concrete should be cured for a minimum of sixteen (16) hours after forms are removed.
 6. Cap and protect exposed back-up walls against wet weather conditions prior to application of fluid applied membrane air barrier assembly.
- B. Notify contractor in writing of any conditions that are not acceptable.
- C. The installing contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this section in accordance with published literature. Commencement of Work or any parts thereof shall mean installer acceptance of the substrate.

3.2. PREPARATION

- A. All surfaces must be sound, dry to touch, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.
- B. Protect adjacent surfaces not included in scope of Work to prevent spillage and overspray.
- C. Hot weather or direct-sun applications over porous substrates, such as concrete, promote rapid surface drying and can form blisters in the fluid applied membrane air barrier during curing. To aid in blister prevention prepare substrate in accordance with one of the following optional procedures:
1. Prime coat:
 - a. Apply a thin prime coat of fluid applied membrane air barrier to substrate.
 - b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.
 - c. Install primary fluid applied membrane air barrier to Air Barrier Manufacturer minimum recommended mil thickness.
 2. Two coat:
 - a. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.
 - b. Allow fluid applied membrane air barrier to fully cure prior to subsequent application.
 - c. Apply fluid applied membrane air barrier to achieve one-half (1/2) of Air Barrier Manufacturer minimum recommended mil thickness.
 - d. Overall dry mil thickness shall be in accordance with Air Barrier Air Barrier Manufacturer published literature.

3.3. INSTALLATION

- A. Ensure substrate is ready to receive fluid applied membrane air barrier in accordance with published literature.
- B. If fluid applied membrane air barrier should freeze while in storage, move containers to a controlled environment above 32 degrees F (0 degrees C) until thawed and re-mix using a hand operated power mixer prior to use.
- C. Fluid applied membrane air barrier shall not be applied when ambient (air) and substrate temperatures are below 20 degrees F (-6 degrees C).
- D. Do not proceed with application of air barrier membrane when rain is expected within 16 hours.

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- E. Apply sealant at sharp corners, changes in substrate plane, penetrations, and edges to form a smooth transition from one plane to another.
- F. Non-Moving Substrate Joint and Crack Treatment:
 - 1. Gaps equal to or less than 3/8 inch (10 mm) wide:
 - a. Sheathing Joint Sealant:
 - 1. Apply sealant at rate recommended by Air Barrier Manufacturer.
 - 2. Spread sealant at joint extending a minimum one (1) inch beyond gap to ensure a continuous air and watertight assembly.
 - 2. Gaps equal to or less than 1/2 inch (12 mm) wide:
 - a. Building Envelope Sealant:
 - 1. Apply sealant at rate recommended by Air Barrier Manufacturer.
 - 2. Spread sealant at joint extending a minimum one (1) inch on each side of substrate gap.
 - b. Liquid applied flashings:
 - 1. Apply liquid applied flashing at rate recommended by Air Barrier Manufacturer.
 - 2. Apply liquid applied flashing in accordance with Air Barrier Manufacturer published literature extending a minimum of two (2) inches on each side of substrate gap.
 - c. Self-adhering flashings:
 - 1. Apply primer to substrate and allow curing in accordance with published literature prior to installation of self-adhered flashing.
 - 2. Apply self-adhering flashing in accordance with Air Barrier Manufacturer published literature extending a minimum of three (3) inches on each side of substrate gap.
 - 3. Roll membrane with countertop roller to eliminate air pockets between self-adhered flashing and substrate ensuring full adhesion of membrane onto substrate.
 - 4. Seal exposed leading edges of self-adhered membrane with sealant.
 - 3. Gaps greater than 1/2 inch wide:
 - a. Contact Air Barrier Manufacturer.
 - 4. Refer to Air Barrier Manufacturer published literature for a complete list of authorized Non-Moving Substrate Joint and Crack Treatment details.
- G. Moving Joints:
 - 1. Contact Air Barrier Manufacturer.
- H. Refer to Air Barrier Manufacturer detail drawings for installation procedures including, but not limited to, the following:
 - 1. Inside corners
 - 2. Outside corners
 - 3. Crack treatment
 - 4. Penetrations
 - 5. Rough openings
 - 6. Control joints
 - 7. Expansion joints
 - 8. Changes in substrate
- I. Contact Air Barrier Manufacturer to coordinate transition of fluid applied membrane air barrier to adjacent areas including, but not limited to, the following:
 - 1. Roof to air barrier
 - 2. Air barrier to waterproofing
 - 3. Fastener penetrations

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- J. Thru-Wall Flashing:
 - 1. Coordinate with Section [project specific].
- K. Primary Liquid Air Barrier Membrane
 - 1. Install fluid applied membrane air barrier in accordance with Air Barrier Manufacturer published literature to ensure an air and watertight fluid applied membrane air barrier assembly.
 - 2. Fluid applied membrane air barrier assembly must be installed in a monolithic application without sags, runs or voids, and transitioning with auxiliary components to create a uniform drainage plane and air barrier.
 - 3. Install fluid applied membrane air barrier and transition membranes so that subsequent membrane installation laps one (1) inch (2.5 cm) onto existing membrane ensuring an air and watertight fluid applied membrane air barrier assembly.
 - 4. Fluid applied membrane air barrier total dry thickness shall be in accordance with Air Barrier Manufacturer published literature. Refer to Air Barrier Manufacturer Technical Data Sheet.
- L. Insulation Adhesive (Optional):
 - 1. Coordinate with Section [project specific] for insulating materials.
 - 2. Upon curing of the air barrier membrane system apply insulation adhesive in a serpentine pattern.
 - 3. Immediately embed insulation into the adhesive and press firmly into place to ensure full contact. Apply additional adhesive if allowed to skin over.
 - 4. Fully butter all joints of insulation panels with adhesive during installation, with the exception of expansion joints.

3.4. FIELD QUALITY CONTROL

- A. Final Observation and Verification:
 - 1. Final inspection of fluid applied membrane air barrier assembly shall be carried out by the Owner's representative, the contractor, or Air Barrier Manufacturer as required by warranty.
 - 2. Contact Air Barrier Manufacturer for warranty issuance requirements.
- B. Fluid applied membrane air barrier assembly is not designed for permanent UV exposure. Refer to Air Barrier Manufacturer published literature for product limitations.

3.5. CLEANING

- A. Promptly as the Work proceeds, and upon completion, clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.
- B. Clean soiled surfaces, spatters, and damage caused by Work of this Section.
- C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

END OF SECTION 07272

SECTION 07175
WATER REPELLENT COATING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish and install water repellent coating to all new exterior masonry and cast stone surfaces.

1.02 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacture of water repellent coatings.
- B. Applicator: Acceptable to manufacturer.

1.03 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Include details of product description, tests performed, limitations to coating , cautionary procedures required during application, and chemical properties, including percentage of solids.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.
- D. Submit manufacturer's certificate under provisions of Section 01400 that coating meets or exceeds specified requirements.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply coating when ambient surface temperature is lower than 40 degrees F or higher than 200 degree F and per manufacturers recommendations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Protectosil CHEM-TRETE 40 VOC, Evonik Industries
- B. Hydrozo Clear 40 VOC by Degussa Building Systems.
- C. Substitutions: Refer to Article 4.3 - Instructions to Bidders and Section 01600 - Materials and Equipment

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify joint sealants are installed and cured.
- B. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.
- C. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Remove loose particles and foreign matter.
- B. Remove oil or foreign substance with a chemical solvent which will not affect coating.
- C. Scrub and rinse surfaces with water and let dry.
- D. Protect adjacent surfaces not scheduled to receive coating.
- E. If applied on unscheduled surfaces, remove immediately, by approved method.
- F. Protect Landscaping, property, and vehicles.

3.03 APPLICATION

- A. Delay work until masonry mortar, concrete substrate is cured a minimum of 60 days.
- B. Apply coating in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Sound Batt insulation in walls & ceilings.
- B. Batt insulation as indicated on Drawings and/or as specified herein.
- C. Furnish and install drainable insulation as indicated on drawings and as specified herein.

1.02. SUBMITTALS

- A. Submit manufacturer's installation instructions and product literature under provisions of Section 01300.
- B. Submit 2 samples of each type of insulation. (Samples size: 6" x 6" minimum.)
- C. Submit 2 samples of each type of fastener proposed and recommended by manufacturer.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - BATT INSULATION

- A. Batt Insulation
 - 1 Owens/Corning Fiberglas, Unfaced
 - 2. Manville Fiberglass- Unfaced
 - 3. CertainTeed Fiberglass - Unfaced
 - 4. Substitutions: Under provisions of Section 01600 and Instructions to Bidders

2.02 BATT INSULATION

- A. Unfaced fiberglass blankets (exterior walls only): The manufacturer's certified "R" factor designation shall be shown on the product packages or on the product.
 - 1. Thickness: 3-1/2" inches at interior walls only . "R" Value: 13 for 3-1/2" inch thick insulation.
 - 2. Thickness: 6-1/4" inches at exterior walls. "R" Value: 19.
 - 3. Thickness: 9-1/2" at **ceilings**. "R" Value: 30 . (Only as indicated on Drawings.)
- B. Testing Information
 - 1. Flame Spread Classification: 25
 - 2. Smoke Developed Classification: 50 or less
 - 3. Fuel Contributed Classification: 25 or less
 - 4. Testing; ASTM E-84-68, UL 723, NFPA 255.

2.03 SOUND ATTENUATION BATTS

- A. Unfaced mineral wool fiber blanket insulation produced by combining mineral fibers.
- B. Materials to comply with ASTM C 665 for Type I .
- C. Thickness: 3-1/2" min.

2.04 CONTINUOUS EXTERIOR WALL INSULATION: MINERAL FIBER BLOCK AND BOARD THERMAL INSULATION

- A. Product: Equal to Cavityrock by ROCKWOOL - www.rockwool.com.
- B. Overall Thickness: **1 1/2"**
- C. R-Value: 4.2/inch
- D. Accessories: Provide all accessories as recommended by manufacturer for complete installation.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify adjacent materials are dry and ready to receive installation.
- B. Verify mechanical and electrical services within walls have been installed and tested.

3.02 INSTALLATION OF BATT INSULATION

- A. Install batt insulation in accordance with manufacturer's instructions.
- B. Install batt insulation, in exterior walls and ceiling spaces without gaps or voids and as indicated on drawings.
- C. Trim insulation neatly to fit spaces. Use batts free of damage.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.
- E. Install insulation with factory applied membrane facing the **exterior side** of building spaces. Lap ends and side flanges of membrane to provide complete system.

3.03 INSTALLATION OF DRAINABLE INSULATION: POLYISOCYANURATE INSULATED DRAINAGE SYSTEM

- A. Install per manufacturer's written instructions and recommendations.
- B. Tape all exterior corner conditions.
- C. Coordinate with installation of exterior sheathing and Self-Adhered Sheet Membrane Air Barrier, Vapor Impermeable- Section 07273.

END OF SECTION

SECTION 07212
BLANKET INSULATION FOR METAL BUILDINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. Thermal insulation and moisture control system for metal buildings for the following applications:
 - 1. Roofs, with OSHA Compliant, leading-edge fall protection.
- B. Related Sections:
 - 1. Fabricated Engineered Structures.
 - 2. Metal Building Systems.
 - 3. Fire Suppression.
 - 4. Plumbing; Rough-in utilities.
 - 5. HVAC; Rough-in utilities.
 - 6. Electrical; Rough-in utilities.

1.2 REFERENCES

- A. American Society for Testing of Materials (ASTM):
 - 1. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
 - 2. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - 3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).
 - 5. ASTM E 2178 – Standard Test Method for Air Permeance of Metal Buildings.
- B. North American Insulation Manufacturers Association (NAIMA):
 - 1. NAIMA 202-96(R) (Rev. 2000) STANDARD For Flexible Fiberglass Insulation to be Laminated for Use in Metal Buildings.
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Underwriters Laboratories (UL):
 - 1. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 DESIGN REQUIREMENTS

- A. Insulation **R-Value of 30** for installed roof system.
- B. The installed roof and wall systems shall provide a continuous vapor barrier.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's data for each of the following, including:
 - 1. Roof installation instructions.
 - 2. Product data sheet.
 - 3. Design consideration guide.
 - 4. Recycle content certification for fiberglass insulation products – minimum 50% recycled content for all fiberglass insulation materials.
- B. Shop Drawings: Provide shop drawings that indicate the following:
 - 1. Liner fabric layout.
 - 2. Insulation layout and cut list.

3. Customer and project information.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Companies shall be familiar with the installation practices associated with banded liner systems.

1.6 SAFETY PRECAUTIONS

- A. Installation contractor must have a site-specific safety plan and comply with all OSHA applicable local rules and regulations when installing this system.
- B. Workers must use OSHA required fall protection when installing the banding and fabric system at heights (see OSHA regulations at 29 CFR 1926, Subpart M).
- C. Insulation System shall meet the following:
 1. OSHA 29 CFR 1926.502(c)(4)(i) – Except as provided in paragraph (c)(4)(ii) of this section, safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop test shall consist of a 400-pound (180 kg) bag of sand 30" ± 2" (76 cm ± 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not less than 42" (1.1 m) above that level.
 2. OSHA 29 CFR 1926.502(i)(2) – All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment and materials that may be imposed on the cover at any one time.
 3. OSHA 29 CFR 1926.754(e)(3) – covering roof and floor openings.
 4. OSHA 29 CFR 1926.754(e)(3)(i) – Covers for roof and floor openings shall be capable of supporting, without failure, twice the weight of the employees, equipment and materials that may be imposed on the cover at any one time.
- D. Banding has sharp edges. Cut proof gloves should be worn when handling.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products indoors or in a dry, covered area.
- B. Do not open products until ready to use.
- C. Protect products from potential construction site damage.
- D. Use care when opening products as pallets may shift during shipment.
- E. Banding has sharp edges. Wear cut proof gloves when handling.
- F. Wear safety glasses when unpacking materials.

1.8 PROJECT CONDITIONS

- A. For best results, do not install this system outside of the temperature, humidity, ventilation, and environmental limits recommended by the manufacturer. Products should be kept covered and dry at temperatures less than 100°F prior to installation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. For the purpose of establishing quality and type products as manufactured by Bay Insulation Systems, Inc., Green Bay, WI, 54311; www.bayinsulation.com. Have been specified.
- B. Equal products as manufactured by Thermal Design (info@thermaldesign.com Phone 800-255-0776) are approved for bidding.

- C. Substitutions: Per Instructions to Bidders and Section 01600.

2.2 MATERIALS

Note: Bay Insulation Systems shall approve all materials used in the SkyLiner® Insulation System. Contact Bay Insulation for specific materials approved for use within the SkyLiner® Insulation System.

- A. The SkyLiner® System materials:
1. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
 - a. ASTM C1136, Types I through VI.
 - 1) Type 1-IV exception for dimensional stability (value is <2.0%).
 - b. Perm rating: 0.02 or 0.03 when tested in accordance with ASTM E 96 Procedure A.
 - c. Flame Spread Index < 25 and Smoke Developed Index < 50 when tested in accordance with ASTM E 84.
 - d. Color:
 - 1) Bright White,
 2. Vapor barrier adhesive. Complies with the following:
 - a. BayGrip™ Contact Adhesive; CA Compliant.
 - b. BayGrip™ Fast Dry Pressure Sensitive Adhesive; CA Compliant.
 3. Double sided vapor barrier tape. Complies with the following:
 - a. SkyLiner Double-Faced Tape.
 - b. 2" width.
 4. Patch tape. Complies with the following:
 - a. SkyLiner Repair Tape.
 5. Metal Banding/Straps. Complies with the following:
 - a. SkyLiner® Banding, 1" x 0.023 continuous length metal banding.
 - b. Exposed color to match vapor barrier.
 - 1) White.
 6. Thermal breaks.
 - a. Closed cell polyethylene foam tape for wall applications. Complies with the following:
 - 1) 0.125" thick to 0.375" thick.
 - 2) 3.0" wide.
 - b. Thermal spacer blocks. Complies with the following:
 - 1) Extruded or expanded polystyrene.
 - 2) Minimum width 3.0".
 - 3) Thickness 0.5" to 1.0".
 7. Fasteners & Clips.
 - a. SkyLiner® Safety Clip System, to include offset clip + fastener + banding, 16" either side of each frame. (Required for fall protection installation.)
 - b. Tek 2 and Tek 4.5.
 8. Insulation Hangars.
 - a. SkyLiner® SkyHook™ for Walls.
 - b. SkyLiner® Insul-Hold for Walls, insulation hangars.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify structure, bracing, and concealed building systems

have been tested and inspected.

- B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install liner system in accordance with manufacturer's installation instructions and approved shop drawings.
- B. Purlin and girt attachment surfaces should be clean and dry prior to attaching two-faced tape or sealing adhesive.
- C. Installed fiberglass insulation should fit snugly against purlin and girt walls in the cavity space. Avoid gaps, voids, and any excess compression.

3.3 CLEANING

- A. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads should be avoided.

END OF SECTION

SECTION 07215
SMOKE/FIRESTOPPING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install all materials and accessories required to maintain all fire partitions as indicated on plans (2 hour fire, one hour fire, 2 hour fire and smoke, and one hour fire and smoke partitions only) and as specified herein.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 thru Division 16 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Upon completion of this portion of the Work, complete and post a certificate of insulation compliance in accordance with pertinent requirements of governmental agencies having jurisdiction.

1.03 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

1.04 SUBMITTALS

- A. Submit shop drawings, "UL" System No. & Design No., product data, and manufacturers installation instructions under provisions of Section 01300.
- B. Provide penetration details of all conditions including but not limited to, duct, conduit, cable trays, piping, cable, etc.

PART 2 - PRODUCTS

2.01 SMOKE /FIRESTOPPING MATERIAL - APPROVED MANUFACTURERS

- A. HILTI: phone 800-879-8000.
- B. TREMCO
- C. Spec Seal
- D. Substitutions: under provisions of Section 01600 and Instructions to Bidders.

2.02 OTHER MATERIALS

- A. Pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows:
 - 1. Space between the penetrating item and the fire barrier shall:
 - a. Be filled with a appropriate material capable of maintaining the fire resistance of the fire barrier, or

- b. Be protected by an approved device designed for the specific purpose.
- 2. Where the penetrating item uses a sleeve to penetrate the fire barrier, the sleeve shall be solidly set in the fire barrier, and the space between the item and the sleeve shall:
 - a. Be filled with a material capable of maintaining the fire resistance of the fire barrier, or
 - b. Be protected by an approved device designed for the specific purpose.
- B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Remove, or protect against, projections in construction framing which may damage or prevent proper insulation.

3.02 INSTALLATION

- A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position.
- B. Fire stops and fire and smoke stops shall be rated for assemblies as indicated on Drawings.

END OF SECTION

SECTION 07216
GRANULAR INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Granular insulation in cavities of concrete masonry unit walls.
- B. Option: Expanded polystyrene insulation in masonry cavities.

1.02 References

- A. ANSI/ASTM C549 - Perlite Loose Fill Insulation.
- B. ASTM C516 - Vermiculite Loose Fill Insulation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Grace, Zonolite
- B. Perlite Institute, Inc.
- C. **Contractor's Option:** Expanded polystyrene insulation: KORFIL Block Insulation by Concrete Block Insulating Systems, Inc.
- D. Substitutions: Under provisions of Section 01600 and Instructions to Bidders, Article 3.3.

2.02 MATERIALS

- A. Granular Insulation: Vermiculite type or Perlite type, water repellent, fire resistant, flame/fuel/smoke contribution of 0/0/0, in accordance with ANSI/ASTM E84.
- B. **Option:** Expanded polystyrene insulation shall be individually molded to have a minimum density of 1.0 P.C.F., and shall conform to ASTM C578 Standard Type I.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Place granular insulation in walls in accordance with manufacturer's instructions. Verify holes and openings have been sealed to prevent escape of insulation.
- B. Place after masonry materials have sufficiently dried and attained optimum moisture content.
- C. Place as masonry is erected.
- D. Ensure spaces are completely free of mortar to allow free flow of insulation.
- E. Completely fill spaces. Place in lifts and rod to eliminate air pockets. Do not exceed six feet pouring height. Place prior to covering cores with bond beams or lintels.

- F. Place temporary signs in rooms which face insulated walls warning workers to use caution to prevent loss of insulation if cutting into walls.

3.02 INSTALLATION OPTION

- A. Inserts shall be installed in the cores of blocks at the Block Producer's Plant so that only blocks with inserts already installed are delivered to the job site.
- B. Inserts shall be properly installed in accordance with manufacturer's specifications to allow blocks to be handled or saw cut without danger of insert dislodgment.

END OF SECTION

SECTION 07600
SHEET METAL FLASHING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. All Flashings unless specified or noted otherwise.
- B. Installation of lead flashings for vent pipes.

1.02 STANDARDS

- A. Meet requirements and recommendations of applicable portions of Standards listed:
 - 1. American Society for Testing and Materials. ASTM
 - 2. Lead Industries Association. LIA
 - 3. Federal Specifications. FS
- B. Meet the applicable requirements of the "Architectural Sheet Metal Manual" of the Sheet Metal and Air Conditioning Contractors' National Association, Inc., (SMACNA) unless exceeded by specific requirements of this Section.

1.03 SUBMITTALS

- A. Shop Drawings shall show locations, markings, quantities, materials sizes, fastenings, and shapes. Indicate by dimensions, locations of sheet metal items. Indicate methods of connecting, anchoring, fastening, bracing and attaching work of other trades. Draw Profiles, Sections, and Views of items especially fabricated for this work at a scale large enough to permit checking for design conformity.
- B. Submit descriptive literature and actual samples of any manufactured item approved during bid period, such as gravel stop system, which varies from that specified and detailed.
- C. Submit in accordance with Section 01300.

1.04 COORDINATION

- A. Coordinate sheet metal work with roofing, insulation, mechanical and related work of other trades.

1.05 WIND REQUIREMENTS

- A. All metal flashing shall be installed to withstand a wind load imposed by a **120 m.p.h. wind**, while remaining in place and meet **IBC 2021** requirements.

1.06 DELIVERY AND STORAGE

- A. Arrange deliveries to provide sufficient quantities to permit continuity of installation of any phase or work. Store to prevent damage to materials or structure.

1.07 WARRANTY

- A. The Contractor for the sheet metal work shall warranty his work in writing free from defects in workmanship for a period of two years after completion, and shall make good all such defects discovered during this period. The warranty, addressed to the Owner, shall be delivered to the Architect.
- B. Material shall be warranted in writing for twenty (20) years non-prorated covering fade, chalking and film integrity - not show a color change greater than 5 NBS color units per ASTM D2244-79. Not show chalking excess of 8 per ASTM D659-80.
- C. This warranty shall include labor and materials through the 20th year.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - PAINTED SHEET METAL FLASHING

- A. Vincent Metal Goods ColorKlad - *Color selected by architect from no less than 24 colors.*
- B. Pac-Clad (same as above)
- C. Substitutions: See Instructions to Bidders and Section 01600 - Substitutions.

2.02 MATERIALS - PAINTED SHEET METAL FLASHING

- A. All materials shall be 24 gauge hot dipped galvanized steel (G-90) commercial quality, extra smooth primed and finished one side with Kynar based fluoropolymer coating 1.0±0.1 mil total dry film thickness unless noted otherwise.
- B. A wash coat of .3-.4 mil dry film thickness shall be applied to the reverse side.
- C. The pre-painted finished side shall be coated with a liquid applied factory installed strippable film for protection of the finished surface during shipping, fabrication and installation.
- D. The material shall be protected from heat and direct sunlight to prevent deterioration of the strippable film and possible finished coating.
- E. **Color as selected by Architect.**

2.03 PERFORMANCE CRITERIA - PAINTED SHEET METAL FLASHING

- A. The 70 percent Kynar based finish coating shall conform to the following tests and standards: Hardness-F Minimum NCCA Technical Bulletin 11-12. Adhesion, Cross Hatch- 1/16 inch (no removal): NCCA Technical Bulletin 11-5. Formability, 2T Bend (no cracking or removal): ASTM D522-60 (1973). Reverse Impact, no removal when taped: NCCA Technical Bulletin 11-6 (impact force-70 in. lbs.).
- B. The base metal shall conform to the following tests and standards: Minimum yield: 36,000 PSI ASTM 370-77. Coefficient of Thermal Expansion - 6.7×10^{-6} in/in/F°; ASTM E228-71 (1979), Modulus of Elasticity - 29×10^6 , ASTM E111-61 (1978).

2.04 SHEET METAL TYPES AND USES

- A. Cap flashing, fascias, gravel stops and cleats, splice plates at gravel stops and cap flashing and equipment curbs: Painted sheet metal.

- B. Expansion joints and cleats, area divider flashing and all other areas not specifically addressed: Pre-painted sheet metal.
- C. Vertical expansion joints and through wall flashing:
Pre-painted sheet metal.
- E. Stack projections and plumbing vents: 4# lead.
- F. Roof vents, watertight umbrellas and pitch pockets:
Pre-painted sheet metal.

2.05 MISCELLANEOUS MATERIALS

- A. Lead: 4# hard lead, containing not less than 3-3/4% nor more than 4-1/4% antimony, not less than 0.07% nor more than 0.10% arsenic and the remainder shall be lead.
- B. Solder: Conform to ASTM B32-70, 60% tin,, and 40% lead used with acid flux of type recommended for stainless steel; except use non-corrosive rosin flux over tinned surfaces.
- C. Nails: Stainless steel, size and type recommended for each application.
- D. Flashing Cement: Asphalt based.
- E. Primer Coating: Asphalt based.
- F. Caulking: See Section 07951.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces that are to receive sheet metal. Report unsatisfactory conditions.
- B. Do not start installation of sheet metal until unsatisfactory conditions have been corrected.
- C. Proceeding with installation of sheet metal will be construed as evidence of acceptance of conditions under which sheet metal work will be done.
- D. Except as otherwise indicated, comply with SMACNA's "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

3.02 CORROSION PROTECTION

- A. Provide positive protection to prevent electrolysis between dissimilar metals used in contact with one another.
- B. Protect metals from corrosion when embedded in, or in contact with other materials.

- C. Coat flanges of sheet metal in contact with roofing with one coat primer coating prior to installing.

3.03 SHEET METAL

- A. Install all shop and job fabricated flashing according to details and approved Shop Drawings or the SMACMA manual.
- B. Fabricate sections up to 10 feet long in one piece. Fold all exposed edges back.
- C. Install flashing items as necessary to obtain weathertight condition.
- D. Leave 1/2 inch gap at end joints and install 18 inches long cover plates set in roofing cement.
- E. Solder all corner joints. (Inside and outside corners)
- F. Form all sheet metal accurately to the dimensions and shapes required, finishing all molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit and soldering securely.
- G. Unless otherwise specifically permitted by the Architect, turn all exposed edges back 1/2 inch.
- H. Expansion: Form, fabricate, and install all sheet metal so as to adequately provide for expansion and contraction in the finished work.
- I. Weatherproofing: Finish watertight and weathertight where so required.
- J. Make all lock seam work flat and true to line, and sweated full of solder.
- K. Make all lock seams and lap seams, when soldered, at least 1/2 inch wide.
- L. Where lap seams are not soldered, lap according to pitch but in no case less than 3 inches.
- M. Make all flat and lap seams in direction of flow.

3.04 INSTALLATION OF PAINTED SHEET METAL

- A. Colorclad shall be cut, formed, or riveted using hand or power tools. Fabricate and install in accordance with drawing and specification using recognized sheet metal practices.
- B. Keep cutting edges sharp, clean, properly dressed and closely aligned. Exercise care during fabrication and erection to avoid damage.
- C. Use color matched touch-up paint and rivets where required.
- D. Coating must be mechanically removed if soldering is necessary.
- E. All fabrication and installation shall be accomplished with the strippable film in place.
- F. After installation is complete immediately remove strippable film. Extended exposure of strippable film to ultraviolet light may damage paint coating underneath.

3.05 NAILING

- A. Wherever possible, secure metal by means of clips or cleats without nailing through the metal.
- B. In general, space all nails, rivets, and screws not more than 8 inches apart and, where exposed to the weather, use lead washers.
- C. For nailing into wood, use barbed roofing nails 1-1/4 inch long by 11 ga. through flat tin discs.

3.06 SOLDERING

- A. Thoroughly clean and tin all joint materials prior to soldering.
- B. Perform all soldering slowly in order to heat the seams thoroughly and to completely fill them with solder.
- C. Make all exposed soldering on finished surfaces neat, full flowing, and smooth.
- D. Cleaning: After soldering, thoroughly wash acid flux with a soda solution.

3.07 CLEAN-UP

- A. Remove soil, stain, and extraneous materials incidental to sheet metal work from adjacent surfaces. Remove and replace work that cannot be satisfactorily cleaned.
- B. Remove foreign matter and clean sheet metal work to satisfactory conditions to receive specified finish.
- C. For sheet metal work to receive no further finish, clean and protect exposed surfaces to present a neat, uniform and specified finish on completion of work.
- D. Repair any damaged sheet metal to match adjacent sheet metal work. Remove and replace damaged or defective work that cannot be satisfactorily repaired. Repairs that appear obvious as a patch will not be acceptable

END OF SECTION

SECTION 07605
THRU-WALL FLASHING (DAMP COURSE)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Thru-Wall Flashing shall be provided at Door Lintels, Window Lintels and Sills, Base of Walls, Wall Lintels, and as indicated on Drawings and as required to maintain positive drainage from within walls to the exterior.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Description: Electrolytic sheet copper, bonded on both sides and edges to asphalt saturated cotton fabric with ductile asphalt mastic, full sheet crimped 3 oz or 5 oz copper coated with flexible asphalt: Cop-A-Cote by Afco Products
ACC by Phoenix Building Products
Copper Seal by York Manufacturing
- B. Mastic: Asphaltic type as recommended by flashing manufacturer.
Manufacturers:
 - 1. Plascal Corp.
 - 2. Nevastrol

PART 3 - EXECUTION

3.01 INSTALLATION OF THRU-WALL FLASHING

- A. All surfaces to be flashed shall be clean and dry.
- B. Lay flashing material in a slurry of fresh mortar topped with a full bed of mortar.
- C. Start flashing 1/2 inch from outside face of wall. Turn flashing up as detailed and secure in reglet where reglets are called for on Drawings. Coordinate work with masonry work.
- D. Carry flashing 6 inches beyond steel lintels at heads. Turn flashing up to divert water at heads & sills.
- E. When membrane flashing makes level changes and turns at corners, tightly place flashing material against surface it is protecting and secure in place with mastic. Provide weeps over flashing at 24 inches o.c.
- F. Use mastic on all vertical surfaces and wherever required to hold flashing material in place.

3.02 CLEANING

- A. Remove all soil and stain from adjacent surfaces caused by membrane flashing work. Dispose of excess materials and debris away from site. Remove and replace all defective flashing.

END OF SECTION

SECTION 07951
CAULKING AND SEALANTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Interior and exterior caulking.

1.02 SUBMITTALS

- A. Samples: Submit for selection by Architect, samples of caulking compound for each color required. Prepare sample joint where directed by Architect/Engineer before using caulking compound of color selected; work shall be done in accordance with the approved sample.
- B. Manufacturer's Recommendations: Submit two copies of manufacturer's written recommendations for use and installation of each product used. Keep one copy of each on Project site when caulking and sealing is in progress.

1.03 DELIVERY AND STORAGE

- A. Deliver packaged materials to site in manufacturer's original, unopened, labeled containers.
- B. Arrange deliveries to provide sufficient quantities as necessary to permit continuity of any phase of work.
- C. Store and handle caulking and sealing items to prevent damage to materials or work in place.

1.04 WARRANTY

- A. Warranty this work in writing against defects in materials and workmanship for a period of one year from date of acceptance of Project.

1.05 WEATHER CONDITIONS

- A. Do not proceed with caulking and sealing under adverse weather conditions, or when temperatures are above or below manufacturer's recommended limitations for installation or excessive moisture is present.
- B. Proceed with this work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength, and so sealant will not be subjected to excessive elongation and bond stresses.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

- A. Exterior Caulking Compound: One-component, silicone sealant. Colors as selected by Architect. The following are approved for bidding, all others require pre-bid approval per 3.3 of Instructions to Bidders and Section 01600 Material and Equipment - Substitutions.
 - 1. Omniseal: by Sonneborn
 - 2. 795 by Dow Corning Corp.
 - 3. Silpurf 2000 by G.E.

- B. Interior Caulking Compound: Latex-rubber-modified, acrylic-emulsion-polymer sealant, permanently flexible, non-staining and non-bleeding. The following are approved. All others require pre-bid approval per 3.3 of Instructions to Bidders and Section 01600 Material and Equipment - Substitutions.
 - 1. Ac-20 Acrylic Latex, manufactured by Pecora Chemical Corp.
 - 2. Chem-Calk 600, manufactured by Woodmont Products, Inc.
 - 3. Sonolac, manufactured by Sonneborn.
- C. Back-Up for Joints in Hollow Metal and Aluminum Frames: Resilient type such as resilient foam rod, sponge rubber hose or rod stock, or supporting type such as cork or non-impregnated fiber board.
- D. Back-Up Material for Joints in Masonry, Precast Concrete and Natural Stone Panels and Use at Joints Between Dissimilar Materials:

Resilient, open cell foam rod, or approved equal.
- E. Caulking Primer: As recommended by manufacturer of caulking compound.
- F. Bond Breakers: Polyethylene tape, or equal as recommended by manufacturer of caulking compound.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. Employ only qualified workmen, skilled in this type of work.

3.02 EXAMINATION

- A. Examine surfaces that are to be caulked. Report unsatisfactory conditions. Before beginning caulking make sure clear liquid sealers used on precast concrete panels have been mechanically removed from all surfaces which are to receive caulking compounds.
- B. Do not start caulking until unsatisfactory conditions have been corrected.
- C. Proceeding with installation of caulking will be construed as evidence of acceptance of conditions under which work will be done.

3.03 PROTECTION

- A. Protect adjacent surfaces from damage, soiling and adhering of compound.
- B. Protect caulked surfaces from scratching, scraping and puncturing.

3.04 PREPARATION

- A. Properly prepare joints and surfaces to receive caulking compound. Mask or protect as necessary to prevent smearing adjacent surfaces.
- B. Remove dust, soil, moisture, rust, grease and loose foreign materials that could interfere with caulking.
- C. Rake mortared or grouted joints requiring caulking as necessary to obtain minimum of 1/4 inch for caulking. Maintain caulking width of not more than dimension indicated.
- D. Complete caulking before finish painting is started.

3.05 INSTALLATION

- A. Comply with compound manufacturer's printed installation recommendations except where more stringent requirements are shown on Drawings or specified.
- B. Prior to applying caulking compound, clean and prime all joint surfaces in accordance with manufacturer's recommendations.
- C. Apply bond breakers where specified and wherever required by manufacturer's recommendations to ensure that compound will perform properly.
- D. Pack joints with specified backer as required. Install specified gaskets and other materials as detailed.
- E. Apply compound with gun having nozzles of proper size and shape for joint required. Use sufficient pressure to fill all of joint leaving no voids. Superficial pointing of joints with a slim bead will not be accepted. Do not permit excess caulking or priming material to remain on exposed faces of adjacent surfaces. Do not trim edges of caulking with knife or instrument after joints have been tooled.
- F. Finish joints to a slightly concave surface, unless specified or shown otherwise.
- G. Remove excess caulking and leave surface of applied compound neat, smooth and clean. All caulked joints

shall be watertight and conform in size and shape to that indicated on Drawings or as required to render the building watertight.
- H. Use only colors matching approved samples.

3.06 CAULKING JOINTS IN EXTERIOR SURFACES

- A. Apply bond breakers where required to prevent adhesion of compound to back of joint.
- B. Pack joints where a suitable backing has not been provided with specified backing material of proper dimensions, to allow for the correct balance of joint and compound dimensions. Regulate joint width to depth proportions generally as follows:

WIDTH

DEPTH

1/4"(-) 1/4"

1/4" to 1/2" Same as width dimension

1/2" to 1"1/2"

1" (+)Half of width dimension

- C. Install caulking compound as specified under "Installing" above.

3.07 CAULKING PERIMETER JOINTS IN EXTERIOR DOORS AND WINDOWS

- A. Pack joints more than 1/2 inch deep and joints not properly backed with specified backing material to 1/4 inch of adjacent surface.
- B. Caulk both sides of frame. Provide completely weathertight joint securely adhered to frame and surrounding surface. Set threshold, saddles, and sills in non-sag compound.
- C. Install caulking compound as specified under "Installing" above.

3.09 CLEAN-UP

- A. Remove soil, stain and extraneous material, caused by caulking work, from adjacent surfaces. Use only solvents or cleaning agents recommended in writing by caulking compound manufacturer.
- B. Repair or remove and replace damaged, defective or sloppy work.
- C. Remove and replace adjacent work that cannot be satisfactorily cleaned.

END OF SECTION

SECTION 08113

HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.
- 2. Steel sidelight, borrowed lite and transom frames.
- 3. Louvers installed in hollow metal doors.
- 4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

- 1. Division 01 Section "General Conditions".
- 2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
- 3. Division 08 Section "Flush Wood Doors".
- 4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
- 5. Division 08 Section "Door Hardware".
- 6. Division 08 Section "Access Control Hardware".
- 7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
- 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- 6. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
- 7. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- 8. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

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9. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
10. 10. SDI-113 Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door & Frame Assemblies.
11. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
12. ASTM C1199 - Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods
13. ASTM E1423 - Practice for Determining Steady State Thermal Transmittance of Fenestration Systems.
14. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
15. ASTM E1332 - Standard Classification for Determination of Outdoor-Indoor Transmission Class.
16. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
17. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes.
18. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
19. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
20. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
21. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
22. FEMA P-361 2015/2021 - Design and Construction Guidance for Community Safe Rooms.
23. ICC 500 - 2014/2020 ICC/NSSA Standard for the Design and Construction of Storm Shelters.
24. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
25. TAS-201-94 - Impact Test Procedures.
26. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
27. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
28. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
29. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Maintenance manual must be provided for tornado/hurricane storm shelter impact protective systems.
- C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- D. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

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4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

E. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

F. Informational Submittals:

1. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996, TAS 201, TAS 202, and TAS 203 standards, and certified by a qualified independent third party testing agency acceptable to authority having jurisdiction, with labeling indicating compliance with the design pressure level and debris impact resistance requirements specified for the Project.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

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1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
 - 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
 - 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 - 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 - 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Design: Flush panel.

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2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.4 HOLLOW METAL DOOR AND SHUTTER ASSEMBLIES FOR STORM SHELTERS

A. General: Provide complete tornado or hurricane storm shelter resistant assemblies constructed, test, and listed/labeled to resist the design pressures for components and cladding and missile impact resistance as described in ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Door and shutter systems, tested and complying with ICC 500 (2014/2020) and FEMA P-361 (2015/2021), Design and Construction Guidance for Community Safe Rooms and supported by third party test results.
2. Sheets fabricated on exterior openings from commercial quality hot dipped zinc coated steel complying with ASTM A924 A60. Gauges to be in accordance with manufacturers tested assemblies.
3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
4. Top Edge: Reinforce top of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".

B. Manufacturers Basis of Design:

1. CECO Door Products (C) - StormPro Series.
2. Curries Company (CU) - StormPro Series.

2.5 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

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- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 - 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - M Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 - 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - CM Series.
 - b. Curries Company (CU) - M Series.
- D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 FRAMES FOR STORM SHELTERS

- A. General: Subject to the same compliance standards and requirements as standard hollow metal frames, provide complete tornado or hurricane storm shelter resistant assemblies tested and labeled as complying with ICC 500 (2014/2020) and FEMA P-361 (2015/2021) and supported by third party test listings.
 - 1. Fabricate exterior frames from 14 gauge hot dipped zinc coated steel that complying with ASTM designations A924 A60.
 - 2. Manufacturers Basis of Design:
 - a. CECO Door Products (C) - StormPro Series.
 - b. Curries Company (CU) - StormPro Series.

2.7 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
 - 4. Hurricane Opening Anchors: Types as tested and required for indicated wall types to meet specified design pressure and impact rating criteria.

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- 5. Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors as per manufacturers listing or anchor detail sheets including welded installation methods.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
 - 1. Blade Type: Vision proof inverted V or inverted Y.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.9 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.10 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

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2.11 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 - 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 - 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 - 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 - 7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 - 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:

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- 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 - c. Storm Shelter Openings: Provide jamb, head, and sill anchors in accordance with manufacturer's certified assembly listings.
 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
 11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.12 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

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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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

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1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 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.

END OF SECTION 08113

SECTION 08210
WOOD DOORS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Wood doors, fire rated and anon-rated.

1.02 REFERENCES

- A. ANSI/NWMA I.S.1 - Industry Standard For Wood Flush Doors (Includes Standards I.S.1.1 through I.I.S.1.7).
- B. ANSI A135.4 - Basic Hardboard.
- C. ASTM E90 - Measurement of Airborne Sound Transmission Loss of Building Partitions.
- D. ASTM A152 - Methods of Fire Tests of Door Assemblies.
- E. AWI - Quality Standards of Architectural Woodwork Institute.
- F. NFPA 80 - Fire Doors and windows.
- G. NFPA 252 - Standard Method of Fire Tests for Door Assemblies.
- H. UL 10B - Fire Tests of Door Assemblies.

1.03 DESCRIPTION OF WORK

- A. Extent and location of each type of wood door is shown on Drawings and in schedules.
- B. Types of doors required include the following:
 - 1. Solid core flush wood doors with veneer faces.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of AWI Quality Standard Section 1300 and 1400 Premium Grade. ANSI/NWMA I.S.1.
- B. Fire Door Construction: Conform to ASTM E152, NFPA 252, and UL 10B.
- C. Installed Doors: Conform to NFPA 80 "Standard for Fire Doors and Windows" and which have been tested and rated with single point hardware by UL.
- D. Non-Fire Rated Wood Doors: NWMA Industry Standard I.S.-1 "Wood Flush Doors" of the National Woodwork Manufacturer's Association.
- E. Factory mark each door with NWMA "Quality Certified" Seal of Approval for conformance with NWMA I.S.-1.
- F. Provide UL label on each fire-rated door and panel.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable building codes for fire rated doors and panels.

1.06 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate door elevations, stile and rail reinforcement, internal blocking for hardware attachment, and cutouts for glazing and louvers. As applicable per drawings.
- C. Specific Product Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show photographing of construction below in face veneers, or do not conform to tolerance limitations of NWMA.

The warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors.

Warranty shall be in effect during following periods of time after date of substantial completion.

Solid Core Flush Interior Doors: Five years.

- D. Submit manufacturer's certificate under provisions of Section 01400 that doors and louvers meet or exceed specified fire rated requirements.
- E. Submit samples of **wood stain for approval**.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect wood doors during transit storage and handling to prevent damage, soiling and deterioration. Comply with the "On-Site Care" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 DOOR TYPES

- A. Flush Interior Doors: 1 3/4 inches thick; solid core construction; wood veneer faces, fire rated as indicated.

2.02 DOOR AND PANEL CONSTRUCTION AWI QUALITY Standard

- A. Solid, Non-Rated Core: AWI Section 1300, PC-7 (Minimum).
- B. Solid, Fire Rated Core: AWI Section 1300, as required per Drawings.

2.03 FLUSH DOOR FACING

- A. Facing Quality: AWI premium.
- B. Flush Interior Door Veneer: Red Oak species wood, plain sliced with pair matched grain, for **transparent finish as SELECTED BY ARCHITECT**.

2.04 ADHESIVES

- A. Interior Doors: AWI, ANSI/NWMA, Type II.

2.05 ACCESSORIES

- A. Glass Stops: Rolled metal type designed to conform to UL requirements.
- B. Provide 5" x 12" lock block for exit devices, closers, and mortise locks.

2.06 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 requirements. Attach fire rating label to door edge.
- C. Provide flush doors with 1/2 inch thick edge strips of wood species to match face veneer.
- D. Premachine doors for finish hardware.
- E. Provide Z- or T- shaped metal astragels in one piece to UL requirements for double fire doors to rating required.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Machine cut relief for hinges and closers and coring for handsets and cylinders.
- C. Trim door width by cutting equally on top and bottom edges to a maximum of 3/16 inch.
- D. Trim door height by cutting equally on top and bottom edges to a maximum of 3/4 inch. Trim fire door height at bottom edge only, to a maximum of one inch.
- E. Pilot drill screw and bolt holes.
- F. Prepare doors to receive finish hardware in accordance with AWI requirements.
- G. Install door louvers as instructed per plans.

3.02 INSTALLATION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.03 ADJUSTING AND CLEANING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08305
ACCESS PANELS
(ACCESS DOORS)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Cold rolled steel access doors (panels) and frames as required per Construction Documents.
- B. Two feet x two feet.
- C. Wall access panels .

1.02 SUBMITTALS

- A. Submit product data under provisions of Section 01300.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. For the purpose of establishing quality and type products by ACUDOR Products, Inc.: AS-9000 -Fully Gasketed have been specified.
- B. Equal products by Larsen's and The Williams Bros. Corp. Of America are approved for bidding.
- C. Substitutions : Under provisions of Section 01600 and Instructions to Bidders.

2.02 FABRICATION - WALLS AND CEILING ACCESS - FLUSH PANEL (All Locations unless noted otherwise.)

- A. Fabricate frames , panels, and flanges of 16 gauge cold rolled steel.
- B. Hinge: Concealed pivoting rod.
- C. Hardware: screw driver slot, quarter turn cam lock.
- D. Finish: 5 stage phosphate with prime coat of white to receive paint finish. Paint per Section 09900.
- E. Size: 24 inches square unless noted otherwise.
- F. Location:
 - 1. Locate a minimum of **one access panel per room** at all new monolithic gypsum board ceilings.
 - 2. Provide access panel in walls as required to access valves, dampers, electrical devices, etc.

2.03 FABRICATION - WALLS AND CEILING ACCESS - RECESSED DOOR PANEL (Only as noted specified in particular rooms .)

- A. Fabricate frames and flanges of 16 gauge cold rolled steel.
- B. Hinge: Concealed pin type.
- C. Hardware: screw driver slot, quarter turn cam lock.
- D. Finish: Phosphate dipped gray primed to receive paint finish. Paint per Section 09900.
- E. Size: 24 inches square unless noted otherwise.
- F. Location: **As Indicated on Drawings or as specified herein.**
- G. Door Pane: 16 gauge cold rolled steel.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify rough openings for access and units are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install plumb and level in wall or ceiling opening openings.
- B. **Position to provide convenient access to concealed work requiring access at walls and ceiling. Coordinate in field with all mechanical and electrical items. Do not locate above ductwork, electrical conduit, lights , etc. Provide clean vertical path to door.**
- C. Install and secure rigidly in place in accordance with manufacturer's instructions.
- D. Coordinate with metal framing spacing.

END OF SECTION

SECTION 08361

SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial sectional doors.
- B. Electric Operators

1.2 RELATED SECTIONS

- A. Metal Fabrications: Miscellaneous for steel supports.
- B. Rough Carpentry. Door opening jamb and head members
- C. Door Hardware: Hardware, locks, access panels.
- D. Painting: Field painting.
- E. Parking Control Equipment: Parking control equipment for remote door controls.
- F. Common Work Results for Electrical.

1.3 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- D. ANSI/DASMA 105 – American National Standard Institute Test Method for Thermal Transmittance and Air Infiltration of Garage Doors
- E. ASTM A 123 – Standard Specification for Zinc (hot-dipped galvanized) coatings on iron and steel products.
- F. ASTM A 229 - Steel wire, oil-tempered for mechanical springs.
- G. ASTM E 330 - Structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.
- H. ASTM E 413 - Classification for Rating Sound Insulation
- I. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.

- J. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- K. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- L. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.
- M. ANSI/DASMA 108 - Standard Method for Testing Sectional Garage Doors, Rolling Doors and Flexible Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference
- N. ANSI/DASMA 102 - Specifications for Sectional Overhead-Type Doors
- O. ANSI/DASMA 115 - Standard Method for Testing Sectional Doors, Rolling Doors, and Flexible Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure
- P. FDA 21 CFR 177.1520 - Olefin polymers

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Performance Standards: Provide test data validating the following:
 - 1. Door Section: Gloss retention, fade resistance, FDA compliance, cold crack performance, load to rebound, dent resistance impact.
 - 2. Drive Train: Spring cycle life, track, hinges, rollers, cable assembly, cable strength.
 - 3. Door Assembly: Thermal performance, deflection, wind load.
- D. Shop Drawings:
 - 1. Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
 - 2. Regulatory Requirements and Approvals: Provide shop drawings in compliance with local Authority having Jurisdiction (AHJ).
- E. Certifications:
 - 1. Submit manufacturer's certificate that products meet or exceed specified requirements.
 - 2. Submit installer qualifications.
- F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Utilize an authorized installer of door manufacturer who has demonstrated experience on projects of similar size and complexity.
- B. Manufacturer Qualifications: Company with a minimum of five-year experience in producing the specified type of doors.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 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 recommended limits.

1.8 WARRANTY

- A. Provide manufacturer's standard warranty against defects in material and workmanship, as further described with each model in Part 2 of this Section.
- B. Warrant electrical operator and component parts for two (2) years against defects in material and workmanship.
- C. Warrant electrical operator and component parts against defects in material and workmanship for three (3) years, on the operator.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Raynor, which is located at: 1101 East River Rd. P. O. Box 448; Dixon, IL 61021-0448; Toll Free Tel: 800-4-RAYNOR; Tel: 815-288-1431; Fax: 888-598-4790; Email: architectsupport@raynor.com; Web: www.raynor.com
- B. Substitutions: Per Instructions to Bidders and Section 01600.

2.2 SECTIONAL THERMAL SANDWICH DOOR

A. **ThermaSeal TM175 as manufactured by Raynor Garage Doors:**

1. Doors:
 - a. Operation:
 - 1) Provide doors designed for electric motor operation.
 - b. Jamb Construction: See Drawings
 - 1) Steel jambs with self-tapping fasteners.
 - 2) Masonry jambs with anchor bolt fasteners.
 - c. Structural Performance Requirements:
 - 1) Wind Loads: 13.3 psf design load/ 20 psf test load standard
 - 2) Wind Loads: Uniform pressure of: _____ psf.
 - d. International Energy Conservation Code (IECC) Requirements:
 - 1) Air Infiltration – Maximum air leakage of 0.4 cfm/ft2 is required. Testing shall be in accordance with DASMA 105 test procedure.

- 2) ThermaSeal TM175 provides an air leakage rating of 0.22 cfm/ft² with optional IECC Compliance Package.
 - 3) ThermaSeal TM175 provides an installed U-factor of 0.21.
2. Sections:
- a. **ThermaSeal TM175:**
 - 1) Sections shall be pressure bonded to injected polyurethane foam insulated core. Hinge reinforcement strips shall be 20 gauge galvanized steel, located within section interior. End stiles to be 16 gauge galvanized steel.
 - 2) Material: Steel sandwich construction, 1-3/4 inches (44 mm) thick, roll formed from commercial quality, hot-dipped galvanized (G40 exterior) steel complying with ASTM A 653. Exterior skin shall be constructed of 25 gauge steel and interior skin shall be 26 gauge steel with embossed stucco texture.
 - 3) Finish: Exterior skin to have two coats of paint, one primer coat and one finish coat.
 - a) ColorWave Enamel paint finish, color as selected by Architect from Raynor's ColorWave post paint process featuring 1500 colors of Sherwin Williams Polane Enamel paint.
 - 4) Insulation: Expanded polyurethane with R-value of 16.4.
 - b. Seals: Interior and exterior skins to be separated by a molded thermal break and weather seal along section joint. Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail. Optional dual-durometer vinyl blade seal on top section to prevent airflow above header/
 - c. Trussing: Doors designed to withstand specified windload. Deflection of door in horizontal position to be maximum of 1/120th of door width.
 - d. Full-view window consisting of aluminum stile and rail construction and color matched to door exterior with powdercoat paint. Full View to be provided as follows.
 - a) **1/2 inch insulated glazing options**
 - 1) 1/2 inch (12.69 mm) **Insulated Solarban 60 Low E Tempered Glass** (tinted Gray or Bronze as selected by Architect) consisting of two panes of 1/8 inch (3.2 mm) Tempered insulated glass.
2. Track:
- a. Material: Hot-dipped galvanized steel (ASTM A 653), fully adjustable for adequate sealing of door to jamb or weatherseal.
 - b. Configuration Type: Normal Headroom.
 - c. Configuration Type: Low Headroom.
 - d. Configuration Type: Vertical Lift.
 - e. Configuration Type: Lift-Clearance.
 - f. Configuration Type: Incline.
 - g. Configuration Type: Contour.
 - h. Track Size: 3 inches (76 mm).
 - 1) Jamb Type: Steel, wood, or masonry.
 - a) Mounting: Floor-to-header angles. 13 gauge (2.2 mm) minimum continuous angles from floor to door header. Angle Size: 3-1/2 x 5 inches (89 x 127 mm) on 3-inch track.
 - b) Mounting: Floor-to-shaft angles. 13 gauge (2.2 mm) minimum continuous angles from floor, past header, up to door shaft. Angle Size: 3-1/2 x 5 inches (89 x 127 mm) on 3-inch track.

- c) Mounting: QuikClip. Clip-Angle brackets pre-assembled to 13 gauge (2.2 mm) minimum continuous angle from floor to door header and continuous angle from door header to door shaft. Angle Size: 3-1/2 x 1-1/4 inches (89 x 32 mm) on 3-inch track.
 - i. Finish:
 - 1) ArmorBrite Powdercoat Finish: Color as selected by Architect
- 3. Counterbalance:
 - a. Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.
 - 1) Spring Cycle Requirements: Standard 10,000 cycles.
- 4. Hardware:
 - a. Hinges and Brackets: Fabricated from galvanized steel.
 - b. Track Rollers: 3 inches (76.2 mm) diameter consistent with track size, with hardened steel ball bearings.
 - c. Perimeter Seal: Provide complete weather stripping system to reduce air infiltration. Weather stripping shall be replaceable.
 - 1) For bracket mounted doors provide climate seal or vinyl seal with aluminum retainer.
 - 2) For angle mounted doors provide angle clip-on seal.
 - d. Furnish door system with locks: Exterior lock with five-pin tumbler cylinder, night latch and steel bar engaging track.
 - e. Furnish door system with locks: Interior lock with dead bolt provided with hole to receive padlock provided by Owner.
- 5. ThermaSeal Limited Warranty: Warrants the door sections against defects in material and workmanship, and deterioration due to rust-through for ten years from date of delivery to the original purchaser. Warrant the door sections against delamination of the insulation from the steel skins for ten years from date of delivery to the original purchaser. Window components shall be warranted against defects in material and workmanship for one year from date of Substantial Completion. Warrant all hardware and spring components against defects in material and workmanship for one year (or cycle life of the springs) from date of Substantial Completion.

2.3 ELECTRIC OPERATORS

- A. ControlHoist as manufactured by Raynor Garage Doors:
 - 1. Model:
 - a. Raynor ControlHoist Optima:
 - 1) Motor Horsepower Rating: Continuous 2 HP.
 - 2) Electrical Requirements: 115 volt single phase.
 - 3) Electrical Requirements: 230 volt single phase.
 - 4) Electrical Requirements: 208-230 volt three phase.
 - 5) Electrical Requirements: 460 volt three phase.
 - 6) Duty Cycle: 30 cycles/hour or 300 cycles/day.
 - 7) Control Wiring: Solid state circuitry with provisions for connection of safety edge to reverse, external radio control hook-up and maximum run timer. Provisions for timers to close, monitored reversing devices, mid stop and lock bar sensor capability.
 - a) Provide three button momentary contact "open-stop", constant pressure on close (can be changed to momentary to close).
 - b) Custom wiring.
 - 8) Entrapment protection:

- a) Wired Monitored electric reversing edge extending full width of door.
- b) Wireless Monitored electric reversing edge extending full width of door.
- c) NEMA 1 Monitored photo electric eyes mounted on jambs.
- d) NEMA 4X Monitored photo electric eyes mounted on jambs.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings are square, flush and plumb.
- B. 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. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.
- B. Lubricate bearings and sliding parts, and adjust doors for proper operation, balance, clearance and similar requirements.

3.4 PROTECTION

- A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.
- B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.
- C. Lubricate bearings and sliding parts, assure weather tight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements. Protect installed products until completion of project.
- D. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 DOOR SCHEDULE

- A. Doors 130 C and 130D**
- B. Door 201 B**

END OF SECTION

Section 08363
FOUR-FOLD DOOR SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes Four-Fold metal doors with surface mounted tube frames.
- B. Operation of Four-Fold metal doors includes overhead mounted electro-mechanical operators.

1.3 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 type of product specified consisting of manufacturer's technical Product Data and installation instructions for each type of door required, including data substantiating that products comply with requirements.
- C. Submittal Drawings showing fabrication and installation of Four-Fold metal doors including plans, elevations, sections, details of components, hardware, operating mechanism, and attachments to the other units of Work. Include wiring diagrams for coordination with electrical trade.
- D. Reference list including (5) successful installations of this type of door within the past two (2) years.

1.4 QUALITY ASSURANCE

- A. Doors shall be designed to withstand external or internal horizontal wind loads of **120mph (3 second gust) per ASCE 7-16**. The maximum allowable deflection shall not exceed 1/120 of the span. Fiber stresses in main members shall be limited to 27,000 pounds per square inch. Steel frames shall be designed in accordance with the AISC "Steel Construction Manual".
- B. Door manufacturer shall have at least 10 years experience in manufacturing door type specified.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store delivered materials and equipment in dry locations with adequate ventilation, free from dust and water, and so as to permit access for inspection and handling.
- B. Handle materials carefully to prevent damage.

1.6 WARRANTY

- A. The door manufacturer shall provide a written standard limited warranty for material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For the purpose of establishing design, quality and type, products manufactured by Door Engineering and Manufacturing, 101 Power Dr, Mankato, MN 56001, (800)-959-1352 have been specified. **Model FF300 Series: Glazed.**
- B. Substitutions: Per Instructions to Bidders and Section 01600.

2.2 MATERIALS

- A. Steel Tube: ASTM A513 and ASTM A500/A500M
- B. Steel Sheets: Steel sheets of commercial quality, complying with ASTM A1008 cold-rolled steel sheet.
- C. Hardware: Manufacturer's standard components.
- D. Fasteners: Zinc-coated steel.

2.3 FOUR-FOLD DOORS

- A. Construction: Door framing shall be minimum 11-gauge structural steel tube with 16-gauge steel sheet on the exterior and interior faces. Sheet piling shall be formed on the vertical edges with no visible welds on the interior or exterior panel faces. All frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 1/8 inch in 20 feet. Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.
- B. Surface Mounted Tube Frame: Supply pre-hung tube frame system constructed of minimum TS6x4x3/16", designed to anchor to masonry wall construction or weld to steel structure. All hinges, track supports and operator supports shall be factory attached.
- C. Factory finish: Door Panels and Tube Frames shall be finished with manufacturer's standard PPG Spectracron epoxy primer and polyurethane top coat. Customer to select from Manufacturer's standard color chart or furnish sample to match.
 - 1. Operator and operating hardware shall be powder-coated manufacturer's standard gray.
- D. Hardware: Hardware shall include guide tracks and brackets, trolleys, center guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.
 - 1. All hardware, including hinges and trolleys, shall be bolted to the panel for easy removal for service or panel replacement.

2. Doors up to 16' wide and under 30psf windload shall require no floor mounted supports, guides or tracks.
 3. Top tracks shall be adjustable on the end track hangers to allow for adjustment of the door panels in the open position and easily replaceable without removal of the door framing or operators.
- E. Hinges: Jamb hinges shall be dual shear and have two thrust bearings and two needle bearings. Fold hinges shall be stainless steel and be dual shear with two thrust bearings. All bearings shall be completely concealed within the hinge barrel and include grease zerks. All hinge pins shall be minimum $\frac{3}{4}$ " diameter hardened steel.
- F. Hinge Guards: Provide plastic guards at jamb hinges to prevent access through hinge space.
- G. Weatherstripping: Material shall be adjustable and readily replaceable and provide a substantially weather-tight installation. Weatherstripping at center shall be 1/16" EPDM and include no exposed fasteners on the exterior side of the panel. Weatherstripping at sill shall include two 1/16" EPDM sweeps with an aluminum retainer. The retainer shall be attached to the door with adhesive.
- H. Perimeter Weatherstripping: Provide full perimeter jamb and head weatherstripping.
- I. Vision Panels: Provide 1" insulated, tempered, vision panels of the size, shape and location as noted on the drawings.

2.4 OPERATOR

- A. Each Four-Fold door shall be operated by an overhead mounted electro-mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to the rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.
- B. Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to manual operation.
- C. Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity. The motor shall be wound for three phase 208/230/480 VAC, 60 Hertz operation.
- D. Electric Controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest NEMA standards. **Incoming electrical shall be (Choose One): 120VAC single phase, 208VAC single phase, 208/230VAC 3-phase, 480VAC 3-phase.**
1. Control panel assemblies shall be UL listed as per NFPA70.
 2. Controls shall include a programmable logic controller with digital message display. Controller shall include programmable close timers and programmable inputs/outputs.

3. Controls shall include a variable frequency drive with independent adjustment of the opening and closing speeds.
4. Enclosures shall be NEMA 4 with disconnect switch.
5. Pushbuttons (interior) for each door shall have one (1) momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4.
6. Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
7. Safety edges: Provide monitored electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
8. Photo eyes: Provide (1) exterior, jamb mounted, light Curtain type photo eyes, NEMA 4 rated. Photo eye shall cover from floor level to 72" above floor.
9. Presence Sensor: Provide (1) interior, overhead mounted, presence sensor BEA IS40P or equal. Doors over 16' tall shall include LZR-Widescan or equal.
10. Radio controls: Provide three (3) radio receivers and (3) single button remotes per door. Remotes to open and close doors with single button.
11. **(Provide the following Option) Timer Activation Loop Detectors (fire station applications):** Provide "pulse on exit type" loop detector to activate auto close timer once loop has been activated and cleared, include hand/auto switch to deactivate timer. G.C. to coordinate installation of preformed loop with installer prior to exterior apron being poured.
12. **(Provide the following Option) Warning Horn/Strobe:** Provide warning light and strobe. Include outputs PLC to allow for activation while door is in motion both opening and closing, along with activation prior to closing. Include programmable "delay-to-close" timer which activates the warning horn for a set time, prior to the door closing.
13. Wiring: Door manufacturer shall supply controls and components only. Electrical contractor shall install controls and furnish and install conduits and wiring for jobsite power and control wiring.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Four-Fold metal doors in strict accordance with the approved drawings by qualified door erection crews. All door openings shall be completely prepared by the general contractor prior to the installation of the doors. Permanent or temporary electric wiring shall be brought to the door opening before installation is started and shall be completed so as not to delay the inspection test.
- B. Doors shall be set plumb, level, and square, and with all parts properly fastened and mounted. All moving parts shall be tested and adjusted and left in good operating condition.

3.2 ADJUSTING AND CLEANING

- A. Inspection of the doors and a complete operating test will be made by the installer in the presence of the general contractor or architect as soon as the erection is complete. Any defects noted shall be corrected. After door approval in the above test, the general contractor must assume the responsibility for any damage or rough handling of the doors during construction until the building is turned over to the owner and final inspection is made.
- B. Clean surfaces and repaint abraded or damaged finished surfaces to match factory-applied finish.

3.3 DOOR SCHEDULE

A. Doors 130 A and 130B.

END OF SECTION

SECTION 08410
ALUMINUM ENTRANCES , STOREFRONTS & ALUMINUM WINDOWS
PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Aluminum frames, doors, glazed lights, and windows.
- B. Glass and infill panels.
- C. Anchors, brackets, and attachments.
- D. Perimeter sealant

1.02 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

- A. Section 08712 - Hardware: Door hardware items other than specified in this Section.

1.03 PERFORMANCE - ALUMINUM & STOREFRONTS

- A. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 F degrees without causing detrimental effects to system or components.
- B. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with standard building design pressure of 30 lb/sq. ft. as measured in accordance with ANSI/ASTM E330.
- C. Limit mullion deflection to 1/200, or flexure limit of glass with full recovery of glazing materials, whichever is less.
- D. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.
- E. Limit air infiltration through assembly to 0.06 cu. ft/min/sq ft of assembly surface area, measured at a reference differential pressure across assembly of 0.3 inches water gage as measured in accordance with ANSI/ASTM E283.
- F. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and affected related work.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.
- D. Submit samples under provisions of Section 01300.
- E. Submit two samples, illustrating prefinished aluminum surface, glass setting materials, glass setting

blocks, spacers and sealants.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide wrapping and strippable coating to protect prefinished aluminum surfaces.

1.06 WARRANTY

- A. Provide three year manufacturer's warranty under provisions of Section 01700.
- B. Warranty: Cover complete system for failure to meet specified requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - ALUMINUM ENTRANCES AND STOREFRONTS

- A. Kawneer Frame style -
 - Exterior: Trifab II 45I .
 - Interior: Trifab II 450-w/4-1/2" x 1-3/4" profile.

Exterior Doors shall be Medium Stile Design (Unless noted otherwise) with 10" ADA complying bottom rails.

Interior Doors shall be Narrow Stile Design (Unless noted otherwise) with 10" ADA complying bottom rails.

- B. Equal products by Oldcastle, Tubelite, Vistawall and Efco are approved for bidding.
- C. Substitutions: As provided by Instructions to Bidders and Section 01600.

2.02 MATERIALS - ALUMINUM ENTRANCES & STOREFRONTS

- A. Aluminum extrusions shall be 6063-T5 alloy and temper. Exposed sheets to receive an anodic finish shall be 5005 alloy to match extrusions. Sheet which is not exposed may be 3003 alloy with mill finish. All sections shall be formed true to detail and free from defects impairing appearance, strength or durability.
- B. Sheet Steel: ANSI/ASTM A446.
- C. Steel Sections: ANSI/ASTM A36: shapes to suit mullion sections.
- D. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.

Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.

- E. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with 2 ASTM A386.
- F. Concrete/Masonry Inserts: Cast iron, malleable iron, or hot-dip galvanized steel complying with ASTM A386.
- G. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.

- H. Clear Protective Coatings: AAMA 602.2, compounded specifically for protection of aluminum finish during construction.

2.03 FABRICATED COMPONENTS - ALUMINUM ENTRANCES AND STOREFRONTS

- A. Frames: flush applied glazing stops. (**Profile:** as specified above.)
- B. Systems shall accommodate glass of thickness indicated. Refer to detailed Drawings and Schedules and to Glass and Glazing Section 08800 for type and grade of glass to be used.
- C. Structural aluminum members shall be designed to support a wind load required by governing building code on the wall surface.
- D. Internal drainage shall lead any infiltrated water to the exterior through weep slots in the extruded aluminum sill.
- E. System shall provide for expansion and contraction of the component materials as will be required by an ambient temperature range of 120 degrees F without causing harmful buckling or cracking, opening of joints, undue stress on fasteners, or other effects detrimental to weathering performance.

2.04 HARDWARE - ALUMINUM ENTRANCES AND STOREFRONTS

- A. Hardware: The following items shall be furnished by the Entrance Manufacturer:
 - 1. All doors:
 - a. Top, bottom and intermediate offset pivots.
 - b. Closer : Surface mounted overhead mounted with parallel arm, cover, and installed per ANSI A156.4, Grade 1. Closer to fully comply with all handicapped requirements including ADA. Include the following features:
 - 1) Hold-open arm.
 - 2) Delayed-action closing.
 - c. Threshold - 1/2 inch x 4 inch aluminum mill finish. (1/2" maximum height per Building Code- Exterior doors only).
 - d. Push/Pull "V" style.
 - e. Panic Device - Concealed-rod type panic exit devices actuated by full-width crash bar; comply with UL 305. (**Exterior Doors Only.**)
 - f. Weatherstripping - Automatic door bottom and pile type.
 - g. Mortise or Rim Cylinder provided by Section 08712 as required by particular Aluminum Entrance Manufacturer. This Section shall coordinate with Section 08712 accordingly.

2.05 SEALANTS

- A. All splice covers shall be set in non-drying mastic. Joint sleeves shall be sealed to adjacent members with skinning type elastic sealant. Aluminum heads, sills and jambs shall be sealed to surrounds with a skinning type sealant on inside and outside perimeter joints to block through metal conduction.
- B. Materials:
 - 1. Covers and Joint Sleeves: As recommended by Aluminum Frame Manufacturer.
 - 2. Perimeter Caulking: Complying with materials and installation requirements specified in Section 07951 - Caulking and Sealing.

2.06 FINISHES

- A. Finish for all aluminum specified in this Section shall be Class I Clear Coating conforming to Aluminum Association Standard AA-M12 C22 A42/44. **Color to be Dark Bronze or Clear Anodized AA-M12 C22 A31, #17 Clear as selected by Architect.**
- B. Steel shall conform to ASTM A36-74. All steel shall receive one coat of zinc chromate primer after fabrication. Field welds and scratches shall receive one touch-up coat after installation.

2.06 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials: As specified in Section 08800.

2.07 FABRICATION

- A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.
- B. Rigidly fit and secure joints and corners with screw and spline and internal reinforcement. Make joints and connections flush, hairline, and weatherproof.
- C. Develop drainage holes with moisture pattern to exterior.
- D. Prepare components to receive anchor devices. Fabricate anchorage items.
- E. Arrange fasteners, attachments, and jointing to ensure concealment from view.
- F. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install frames, glazing and hardware in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Coordinate attachment and seal of air and vapor barrier materials. Install sill flashings.

- E. Install hardware using templates provided. Refer to Section 08712 for installation requirements.
- F. Install glass and infill panels in accordance with Section 08800.
- G. Install perimeter type sealant, backing materials, and installation requirements in accordance with Section 07951.

3.03 TOLERANCES

- A. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet, whichever is less.
- B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inches.

3.04 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08710 - DOOR HARDWARE

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".
- 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. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
 - 3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
 - 4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.
 - 5. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
 - 6. FEMA P-361 2015/2021 - Design and Construction Guidance for Community Safe Rooms.
 - 7. ICC 500-2014/2020, ICC/NSSA Standard for the Design and Construction of Storm Shelters.

8. ICC/IBC - International Building Code.
9. NFPA 70 - National Electrical Code.
10. NFPA 80 - Fire Doors and Windows.
11. NFPA 101 - Life Safety Code.
12. NFPA 105 - Installation of Smoke Door Assemblies.
13. TAS-201-94 - Impact Test Procedures.
14. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
15. TAS-203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.
16. 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.

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.

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.

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.
- 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.
- B. Hinges at Storm Shelter Assemblies: At a minimum, provide heavy weight hinges with stainless steel screws used in accordance with and specified as part of a Severe Storm Shelter Opening meeting ICC 500 and FEMA 361.
1. Quantity: Provide the following hinge quantity:
 - a. Three Hinges: For shutters with heights 36 to 60 inches, and doors at height of 80 inches.
 - b. Four Hinges: For shutters with heights > 60 inches to 80 inches, and doors with heights greater than 84 inches.
 2. Quantity: Provide the following hinge quantity:
 - a. Three Hinges: For shutters with heights 36 to 60 inches, and doors at height of 80 inches.
 - b. Four Hinges: For shutters with heights > 60 inches to 80 inches, and doors with heights greater than 84 inches.
 - c. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - d. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - e. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. 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.
 4. Hinge Weight and Base Material: At a minimum, provide heavy weight hinges with stainless steel screws used in accordance with and specified as part of a certified Storm Shelter Opening meeting ICC 500.
 5. Manufacturers:

- a. McKinney (MK) - SP3386/SP3786.
- b. No Substitution.

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.

- 1. Manufacturers:.

- a. Hager Companies (HA).
 - b. Pemko (PE).

2.4 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

- 1. Manufacturers:

- a. Pemko (PE) - SER-QC (# wires) Option.

- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

- 1. Provide one each of the following tools as part of the base bid contract:

- a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.

- 2. Manufacturers:

- a. Hager Companies (HA) - Quick Connect.
 - b. McKinney (MK) - QC-C Series.

2.5 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).
- 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).

2.6 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.
 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: Manufacturer's 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. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 2. Manufacturers:
 - a. Corbin Russwin (RU) - Access 3 AP.
 - b. Sargent (SA) - Degree DG1.
- E. 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. New System: Key locks to a new key system as directed by the Owner.
- F. 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).
- G. Construction Keying: Provide temporary keyed construction cores.
- H. 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.

2.7 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).

2.8 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.
- b. Sargent Manufacturing (SA) - 8200 Series.

2.9 MULTI-POINT LOCKS AND LATCHING DEVICES

- A. Multi-Point Locksets, Storm Shelter: Provide ANSI/BHMA A156.37, Series 1000, Operational Grade 1 and Security Grade 1 Certified Products Directory (CPD) listed multi-point locksets. 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. Approved for usage as part of a complete ICC 500 (2014/2020) and FEMA P-361 (2015/2021) door, frame, and hardware assemblies for storm shelter components.
- e. Lever torque to retract all bolts less than 28 in.lb.
- f. Cycle tested to 1,000,000 cycles.
- g. Seven-year limited warranty for mechanical functions.

2. Manufacturers:

- a. Corbin Russwin Hardware (RU) - FE6600 Series.

- b. Sargent Manufacturing (SA) - FM7300 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.
 - 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.
 - 12. Hurricane and Storm Shelter Compliance: Devices to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or storm shelter products that have been independently third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- 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. Provide exit devices 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 UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.
 - d. Five-year limited warranty for mechanical features.
 - 2. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
 - 3. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 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.
 7. Storm Shelter Compliance: Door closers to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate storm shelter products that have been independently third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): 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 body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
 2. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Sargent Manufacturing (SA) - 281 Series.
- C. 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) - DC6000 Series.
 - b. Sargent Manufacturing (SA) - 351 Series.

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

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).

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. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

- 1. Manufacturers:

- a. Norton Rixson (RF).
- b. Rockwood (RO).
- c. Sargent Manufacturing (SA).

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.

- 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. Hurricane and Storm Shelter Compliance: Devices to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or storm shelter products that have been independently third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

- G. Manufacturers:

- 1. National Guard Products (NG).
- 2. Pemko (PE).

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. Security Door Controls (SD) - DPS Series.
 - b. Securitron (SU) - DPS Series.
- B. Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 - 1. Power supplies shall meet all functions and features as specified herein.
 - a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
 - b. Tolerates brownout or overvoltage input $\pm 15\%$ of nominal voltage.
 - c. Thermal shutdown protection with auto restart.
 - d. Circuit breaker protection against overcurrent and reverse battery faults.
 - e. Integrated battery charging circuit to prevent overvoltage on locking devices.
 - f. Available with a single relay fire trigger or individually triggered relayed outputs.
 - g. Monitoring options as specified.
 - 2. Manufacturers:
 - a. Altronix (AS) - Maximal 3.
 - b. Securitron (SU) - AQD 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.

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.

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
2. PE - Pemko
3. RO - Rockwood
4. RU - Corbin Russwin
5. RF - Rixson
6. OT - Other
7. SU - Securitron

Hardware Sets based on plans dated 07/11/2025

Set: 1.0

Doors: 101A

Description: Ext Sgl Alum

1 Cylinder	Type as required - ACP	630	RU
1 Balance of hardware	By the door manufacturer		OT

Notes: Confirm Cylinder type required. Windstorm required.

CITY OF NATCHITOCHEs NEW FIRE STATION NO. 3
NATCHITOCHEs, LA

Set: 2.0

Doors: 115

Description: Ext Pr Alum

1 Cylinder	Type as required - ACP	630	RU
1 Balance of hardware	By the door manufacturer		OT

Notes: Confirm Cylinder type required. Windstorm required.

Set: 3.0

Doors: 116B, 122

Description: Ext - Sgl - Rim/NL x Pull - Closer/stop - Access Control

1 Continuous Hinge	CFM__HD1 SER*	PE	⚡
1 Rim Exit Device, Nightlatch	ED5200S K157ET M107 M92 MELR M54 ACP	630	
RU	⚡		
1 Door Pull	BF157	US32D	RO
1 Surface Closer w/ spring stop	DC6210 A11	690	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE
1 ElectroLynx Harness	QC-C***P (Length as req's)	MK	⚡
1 Frame Wire Harness	QC-C1500P	MK	⚡
1 Position Switch	DPS-M/W-BK (as req'd per app)	SU	⚡
1 Power Supply	AQD Series	SU	⚡
1 Card Reader / Keypad	By Security Contractor.	OT	

Notes: Doors are normally closed and secure. Presentation of valid credential will allow entry by pull. Upon loss of power, doors will remain secure. Free egress at all times.

Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

Set: 4.0

Doors: 130E, 137

Description: Ext - Sgl - Rim/NL x Lever - Closer/stop

1 Continuous Hinge	CFM__HD1		PE
1 Rim Exit Device, Nightlatch	ED5200S N957ET M107 M54 ACP	630	RU
1 Surface Closer w/ spring stop	DC6210 A11	690	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE

CITY OF NATCHITOCHES NEW FIRE STATION NO. 3
NATCHITOCHES, LA

1 Position Switch DPS-M/W-BK (as req'd per app) SU ⚡

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

Set: 5.0

Doors: 138, 201A

Description: Ext - Sgl - Storeroom - Closer/stop - KP

1 Continuous Hinge	CFM__HD1		PE
1 Storeroom Lock	ML2049 NSM ACP	630	RU
1 Surface Closer w/ spring stop	DC6210 A11	690	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE
1 Position Switch	DPS-M/W-BK (as req'd per app)	SU	⚡

Notes: Hardware meets Windstorm design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

Set: 6.0

Doors: 101B

Description: Sgl - Rim/CR - Closer - Gasket - KP

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Fire Rated Rim Exit, Classroom	ED5200A N955ET ACP	630	RU
1 Surface Closer	DC6200 / 6210 M54	689	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
1 Gasketing	S88BL		PE

Set: 7.0

Doors: 110

Description: Sgl - Rated Rim/CR - Closer - Gasket - KP - Bay

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Fire Rated Rim Exit, Classroom	ED5200A N955ET ACP	630	RU
1 Surface Closer w/ spring stop	DC6210 A11	690	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Gasketing	S88BL		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE

Set: 8.0

Doors: 102

CITY OF NATCHITOCHES NEW FIRE STATION NO. 3
NATCHITOCHES, LA

Description: Sgl - Classroom - Closer - Gasket - KP - Bay

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Classroom Lock	ML2055 NSM ACP	626	RU
1 Surface Closer	DC6200 / 6210 M54	689	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
1 Gasketing	S88BL		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE

Set: 9.0

Doors: 132A

Description: Sgl - Classroom - Closer/stop - Gasket - KP - Bay

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Classroom Lock	ML2055 NSM ACP	626	RU
1 Surface Closer w/ spring stop	DC6210 A11	690	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Gasketing	S88BL		PE
1 Sweep	315CN		PE
1 Threshold	2005AV		PE

Set: 10.0

Doors: 109

Description: Pair - Storeroom - MFB - OH Stop

6 Hinge, Full Mortise	TA2714	US26D	MK
1 Flush Bolt	555 / 557 12" / 72" AFF	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock	ML2057 NSM ACP	626	RU
2 Surf Overhead Stop	9-x36	630	RF
1 Astragal Set (2)	303AS		PE
1 Gasketing	S88BL		PE

Set: 11.0

Doors: 114B, 133, 136

Description: Sgl - Storeroom -OH Stop

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	ML2057 NSM ACP	626	RU
1 Surf Overhead Stop	9-x36	630	RF
3 Silencer	608-RKW		RO

Set: 12.0

Doors: 106, 121

Description: Sgl - Storeroom - Closer / Gasket

3 Hinge, Full Mortise	TA2714	US26D	MK
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CITY OF NATCHITOCHEs NEW FIRE STATION NO. 3
NATCHITOCHEs, LA

1 Storeroom Lock	ML2057 NSM ACP	626	RU
1 Surface Closer	DC6200 / 6210 M54	689	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
1 Gasketing	S88BL		PE

Set: 13.0

Doors: 105, 113A, 113B, 131

Description: Sgl - Office

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Office Lock	ML2051 NSM ACP	626	RU
1 Door Stop	406 / 441H as required	US32D	RO
3 Silencer	608-RKW		RO

Set: 14.0

Doors: 103, 112, 116A, 132B

Description: Sgl - Classroom - Closer - KP

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Classroom Lock	ML2055 NSM ACP	626	RU
1 Surface Closer	DC6200 / 6210 M54	689	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
3 Silencer	608-RKW		RO

Set: 15.0

Doors: 108, 117, 118, 119, 120, 123, 124, 125, 126, 127, 128, 129, 135

Description: Sgl - Privacy - Closer

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Privacy Lock	ML2030 NSVN V20	626	RU
1 Surface Closer	DC6200 / 6210 M54	689	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
1 Gasketing	S88BL		PE

Set: 16.0

Doors: 111

Description: Sgl - Push/Pull - Closer - KP

3 Hinge (heavy weight)	T4A3786	US26D	MK
1 Push Plate	70C-RKW	US32D	RO
1 Pull Plate	107x70C	US32D	RO
1 Surface Closer	DC6200 / 6210 M54	689	RU
1 Kick Plate	K1050 8" BEV CSK	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
3 Silencer	608-RKW		RO

CITY OF NATCHITOCHES NEW FIRE STATION NO. 3
NATCHITOCHES, LA

Set: 17.0

Doors: 130A, 130B, 130C, 130D, 201B

Description: OH Door

1 Cylinder	Type as required - ACP	630	RU
1 Balance of hardware	By the door manufacturer		OT

Notes: Verify cylinder type required.

Set: 18.0

Doors: 134

Description: Single interior with 3 point lock - FEMA StormPro

4 Hinge, Hvy Wt	SP3786 5" x 4-1/2"	US26D	MK
1 Multi-Point Lock	FE6665 NSM M188 ACP	630	RU
1 Surface Closer	DC8210 A10 M54	689	RU
1 Kick Plate	K1050 WS 10" x 2" LDW CSK BEV	US32D	RO
1 Door Stop	406 / 441H as required	US32D	RO
1 Gasketing	S773 (Head & Jambs)		PE

Notes: Door will come with 3/8" undercut. Hardware is specified for design intent and is tested with StormPro doors. Hardware meets design intent as tested in an assembly. Confirm hardware meets Windstorm assembly requirements per door manufacturer.

END OF SECTION 08710

SECTION 08800
GLASS AND GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Provide glazing and glazing accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 STANDARDS

- A. Meet requirements and recommendations of applicable portions of Standards listed:
1. American National Standards Institute. ANSI
 2. Consumer Products Safety Council. CPSC
 3. Flat Glass Manufacturers Association. FGMA
 4. Federal Specifications. FS
 5. Governing Codes and Ordinances
 6. National Glass Association
 7. International Building Code, 2000 edition.

1.03 WIND LOAD AND SAFETY REQUIREMENTS

- A. In-place glazing shall withstand the following wind loads acting normal to plane of glass surface:
1. Less than 30 feet above grade:
 - a. 35 p.s.f. positive pressure (acting inward) min and as required by International Building Code, **2021 edition**.
 - b. 35 p.s.f. negative pressure (acting outward) min and as required by International Building Code, **2021 edition**.
 2. 31 to 60 above grade:
 - a. 45 p.s.f. min and as required by International Building Code, **2021 edition**.
 - b. 45 p.s.f. min and as required by International Building Code, **2021 edition**.
- B. Install tempered glass at all glass entrances and adjoining sidelites and surfaces adjacent to walking surfaces as called for in the glazing code.

1.04 WEATHER CONDITIONS

- A. Do not proceed with installation of liquid sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with glazing only when forecasted weather conditions are favorable to proper cure and development of high early bond strength.

1.05 SUBMITTALS

- A. Physical Samples: Submit for Architect/Engineer's review and approval the following items: *Tinted glass, insulated glass, spandrel glass, glazing film, and rated glass*. Samples will be reviewed by Architect/Engineer for appearance only. Compliance with all other requirements is the exclusive responsibility of the Contractor. (*Do not order glass prior to sample approval.*)
- B. Manufacturer's Literature: Submit two copies of manufacturer's specifications, recommendations and installation instructions for each type of glazing sealant and compound, gasket and associated miscellaneous material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown. Show by transmittal that one copy of each recommendation and instruction has been distributed to the Glazier.

1.06 WARRANTY

- A. By accepting this Contract, the Contractor agrees to warrant his work for one year against becoming unserviceable or objectionable in appearance as a result of being defective or unconforming. Without limiting the warranty scope, the work shall be warranted not to leak or to break due to faulty installation.

PART 2 - PRODUCTS

2.01 GLASS

- A. Plate Glass: Clear and grey plate or float glass, complying with FS DD-G-451, Type 1, Class 1, Quality 3, 1/4" minimum thick
- B. Products offered by manufacturers complying with requirements include the following:
 - 1. ASG Float or Starlux; ASG Industries, Inc.
 - 2. Clear Float; Ford Glass Division.
 - 3. Parallel-O-Float or Parallel-O-Plate; Libby-Owens-Ford Company.
 - 4. Clear Float; PPG Industries.

2.02 TEMPERED GLASS

- A. Quality of Glass for Treatment: Furnish glass for tempering and heat strengthening which complies with FS DD-G-451, for type, thickness, class, and color indicated or specified.
- B. Tempered Glass:
 - 1. Temper glass by manufacturer's standard process to increase strength to not less than four times strength prior to tempering.
 - 2. Tolerances for flatness in any direction, any location except 2 inches wide border, for 1/4 inch thick glass (with inversely proportionate tolerances for thicker glass) shall not exceed the following:
 - a. For 1'-0" run: 1/16" bow
 - b. For 3'-0" run: 1/8" bow
 - c. For 7'-0" run: 1/4" bow
 - d. For 10'-0" run: 3/8" bow
 - 3. Thickness - 1/4 inch minimum.
Note Glazing for mullion-less system shall be 1/2" minimum, tempered glass with polished edges.
 - 4. Cut, fabricate or drill all tempered glass before tempering.
 - 5. Tong Marks: Support each piece of glass during strengthening so that tong marks will be concealed by glazing system.
 - 6. *Tempered Glazing at exterior doors shall be tinted to match insulated panels.*

2.03 INSULATED GLASS-

- A. General requirements for Insulated Glass: Provide hermetically sealed glazing units fabricated of two sheets 1/4" minimum, separated by +/- 1/2 inch dry air or gas filled space with -20 Degrees F dew point, and with a Class A sealant-type edge construction, fabricated to provide the following overall performance characteristics. Glazing shall meet above wind loading design requirements.
- B. Glass in Insulated Units: Heat-strengthened grey, bronze or green tinted glass (as selected by Architect) at exterior, heat strengthened clear glass on interior with Guardian SN68 or PPG Solarban 60 Low-E coating on #3 surface. Note that locations may require tempering of either or both panes. Insulation values shall be certified to meet the following:
 - Visible Light 38 to 41%
 - Reflectance 6%
 - Shading Coefficient .38

U-value Winter .29
U-value summer .30

- C. Edge Construction: Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer-bar frame with welded or soldered sealed corners, and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, of polysulfide, silicone or hot-melt butyl elastomeric sealant (fabricator's option).
- D. Required Performance: Eight percent visible light transmittance, twenty percent maximum visible exterior light reflectance, eight percent maximum total solar energy transmission, and U-value of 0.42 maximum for winter at night.

2.04 FIRE RATED GLASS

- A. Products equal to Technical Glass Products meeting UL tests for rating of doors (*see door schedule*) or walls where located (*see fire plan*). Glazing shall be clear and impact safety rated - FireLite Plus or equal products.
- B. Install in all rated frames using approved glazing compound recommended by manufacturer.
- C. Glass shall bear label with the UL logo and fire rating.

2.05 GLAZING FILM (none anticipated at this time)

- A. Decorative Film to be applied to glazing where shown on drawings shall be selected from full range of patterns of Madico Window Films (www.madico.com) or approved equal.

2.06 SHEET MIRRORS

- A. 1/4 minimum float glass with silver coating.
- B. Edges shall be seamed (sanded smooth)

2.07 LAMINATED TRANSLUCENT GLASS

- A. 0.045 innerlayer film laminated between two 1/4" thick clear tempered glass units. All edges to be polished. (Film to be selected by architect as to amount of light that is filtered through. Provide a minimum of six different samples to be selected from.)

2.08 OTHER GLAZING MATERIALS

- A. Butyl Rubber Glazing Tape: Synthetic polymer based, non- shrinking 100% solid compound, 1/8 inch thick minimum.
- B. Elastic Glazing Compound for Channel Glazing: Two parts polysulfide sealant complying with FS TT-S-227, Class A, Type 2; compounded and tested to show a minimum of 20 years resistance to deterioration in normal glazing applications.
- C. Neoprene blocking, jamb shims and glazing gaskets for setting glass: Setting blocks used to support fixed glass shall be dense neoprene extrusions conforming to ASTM D395-69, Method B of between 70 and 90 Shore A Durometer hardness. Shore A Durometer hardness, length and location all to be as required and recommended in writing by the applicable glass manufacturer.
- D. Jamb shims used to center the glass shall be neoprene conforming to ASTM D395-69 Method B of between 40 and 50 Shore A Durometer hardness. Shore A Durometer hardness, length and location all as required and recommended by the applicable glass manufacturer.

- E. Fixed glazing gaskets shall be closed cell, extruded neoprene compression gaskets conforming to ASTM C509-66T, Grade 4. Gaskets shall be smooth and of profiles as indicated on Architect's drawings with integral locking projections, to engage the curtain wall components.
- F. Wedge glazing gaskets shall be high quality, elastomeric, ozone resistant virgin neoprene compound, conforming to AAMA Standard SG-1-76 and having a Shore A durometer hardness of between 65 and 75. Gaskets shall be smooth and of profiles and sizes required with continuous integral locking projections to engage the curtain wall components, and shall have vulcanized corners to form a continuous seal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and items that are to receive glass. Correct unsatisfactory conditions.
- B. Correct defects that could interfere with proper glazing. Correct warped planes that could place glass in a strain when installed. Do not start glazing until unsatisfactory conditions have been corrected and approved.
- C. Proceeding with glazing work will be construed as evidence that surfaces to receive glass are in condition to permit satisfactory installation.

3.02 WORKING REQUIREMENTS

- A. Handle glass and glazing materials to avoid damage to materials or to work in place. Satisfactorily repair or remove and replace work that has been damaged.
- B. Protect glass from scratching, breaking or other injury while storing, during installation and until work is completed.
- C. Install temporary coverings necessary to prevent damage to finished surfaces during construction. Tape, or temporarily paint, markings on installed glass sufficient to clearly indicate that glass is in place.
- D. Do not remove labels from individual sheets of glass until glazing materials have been installed and approved.
- E. Store and handle glass and glazing materials to prevent damage to materials or structure. Remove broken and scratched glass promptly from site.

3.03 PREPARATION

- A. Cleaning
 - 1. Remove from glazing stops, legs or recesses, grease, oil, lacquer, dirt and other detrimental materials.
 - 2. Use methyl-ethyl-ketone (MEK) or other similar solvents not harmful to aluminum finish.
- B. Conditions:
 - 1. Surface shall be dry and free from frost.
 - 2. Unless otherwise recommended by sealant manufacturer, air temperature at elevation at which glazing with liquid sealants is to take place shall be 40 Degrees F or above.

3.04 SETTING BLOCKS

- A. Required: For glass sizes in excess of 50 united inches.

- B. Material: Neoprene; 70-90 Shore A durometer
- C. Size: 1/8 inch minimum thickness; length to suit load
- D. Location: At quarter points of sill

3.05 SPACER SHIMS

- A. Required: For glass sizes in excess of 50 united inches
- B. Omit: Where non-resilient tape is used and tape is sufficiently hard to resist squeezing out under wind load
- C. Materials: Resilient neoprene; 40-50 Shore A durometer
- D. Location: All four edges; on outside and inside; keep 1/4 inch below sight line; lap glass 1/8 minimum
- E. Size: 1 inch minimum length
- F. Number: Not less than two per edge; maximum 4'-0" o.c.

3.06 INSTALLING GLASS

- A. Installations shall be in accordance with the standards of the FGMS Glazing Manual, latest edition.

3.07 EXTERIOR GLAZING

- A. Install glazing in accordance with aluminum framing and window manufacturer's recommendations for each framing type shown.
- B. Install tempered glass where shown and elsewhere where required to meet CPSC safety standards and windloads.

3.08 GLAZING INTERIOR DOORS AND VISION PANELS

- A. Glaze interior doors and vision panels with specified glass.
- B. Provide wicket openings in glass where shown in dimensions and configuration indicated. Grind exposed edges smooth.
- C. Shim glass as required to install tightly, without warp or stress.

3.09 DRY GLAZING

- A. Install glass in aluminum entrances and frames using gaskets and materials supplied with system in accordance with aluminum frame manufacturer's recommendations.
- B. Grind edges of sliding glass doors in Architectural Woodwork.

3.10 GASKET GLAZING

- A. Install glass using structural gaskets in accordance with gasket manufacturer's instructions and recommendations.
- B. Cut loose zipper strips slightly long to ensure tight fit at corners.

- C. Use only special tool and lubricate to install zipper strip. Do not lubricate glass rabbet or flange rabbet.
- D. Comply with glass manufacturer's recommendations for the possible use of setting blocks, sealants and weepholes in glazing rabbets of structural gaskets.

3.11 WORKMANSHIP REQUIREMENTS

- A. Glass shall be free of distortion caused by installation.
- B. Glazing sealants shall be neatly formed and in proper place.

3.12 CLEANING

- A. Remove soil, stain and extraneous materials caused by glazing from glass and adjacent surfaces. Replace items that cannot be satisfactorily cleaned.
- B. Prior to completion of Project, remove labels, glazing materials, paint and other adhered materials from glass surfaces. Clean and polish surfaces of glass to be free from prints, soil, spots and foreign matter. Leave glass visibly clean when viewed from any angle.
- C. Remove and replace glass that is scratched, cracked, broken, discolored or defective.

END OF SECTION

SECTION 09111
METAL STUD FRAMING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Top and bottom runners, studs, internal bracing, and blocking.

1.02 REFERENCES

- A. ASTM C645 - Non-Loadbearing Steel Studs, Runners, and Rigid Furring Channels.
- B. ASTM C754 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board.
- C. GA 203 - Installation of Screw-type Steel Framing Members to Receive Gypsum Board.

1.03 QUALITY ASSURANCE

- A. Perform the work in accordance with GA 203 and ASTM C754.
- B. Maintain one copy of each document on site.

1.04 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300.
- B. Indicate by plan and elevation, stud framing, openings, bracing and blocking, and reinforcement.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Southeastern Stud & Components, Inc.
- B. ClarkDietrich
- C. Unimast Incorporated.
- D. Substitutions: Under provisions of Section 01600 and Instruction to Bidders.

2.02 MATERIALS

- A. Studs: Interior, Non-Load bearing rolled steel, galvanized, channel shaped, 1-5/8, 2-1/2, 3-5/8, 4, and 6 inches wide, 20 gage, punched for utility access.
- B. Studs: **Exterior, REFER TO SECTION 05400- COLD -FORMED METAL FRAMING.**
- C. Runners: Of same material and finish as studs, bent leg retainer notched at 2 inch centers to receive studs, with provision for crimp locking to stud.

- D. Furring, Headers, Sills, and Bracing Members: Of same material and finish as studs, thickness to suit purpose.
- E. Fasteners: GA 203.
- F. Wood Blocking: Construction grade softwood fire retardant moisture resistant treated.
- G. Provide stud manufacturer's metal tracks, stud shoes, clips, wire ties, stiffeners, and other accessories and attachment devices as required for complete installation.
- H. Finish: Galvanize in accordance with ASTM A525, G90 or heavier coating.
- I. Provide studs which accept snap-in channel bridging only.

2.03 FIRE-RATED ASSEMBLIES

- A. Where steel studs are components of fire-rated wall, partition or column protection assemblies, provide steel studs and accessories complying with the requirements of UL "Fire Resistance Index" for the UL design numbers corresponding with construction assemblies shown.

2.04 STUD TYPES

- A. Provide the following types of steel studs in sizes indicated on the Drawings, for application indicated, as shown or specified:
 - 1. For metal lath applications, provide punched-type steel studs.
 - 2. For gypsum drywall applications, provide screw-type steel studs.

2.05 HAT CHANNELS

- A. Provide channels fabricated from 24 gage sheet metal roll-formed to hat-shaped sections, 7/8 inches deep, 2-9/16 inches wide, with knurled attachment face 1-1/4 inches wide.
- B. Finish: Galvanize in accordance with ASTM A525, G90 or heavier coating.

PART 3 - EXECUTION

3.01 ERECTION

- A. Manufacturer's Instructions: Unless otherwise shown or specified, install steel studs and accessories in accordance with stud manufacturer's printed instructions.
- B. Secure top and bottom runners at 24 inches oc. Align to configuration required.
- C. Install studs vertically at 16 inches oc and not more than 2 inches from abutting construction, each side of opening, and at corners.
- D. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.
- E. Brace stud framing system and make rigid.
- F. Coordinate erection of studs with installation of service utilities, including but not limited to ductwork, piping, electrical conduit trays, etc. Align stud web openings.
- G. Coordinate installation of bucks, anchors, blocking, electrical, and mechanical work to be placed in, behind, or through stud framing.

- H. Coordinate erection of stud system with requirements of door and window frame supports or attachments.
- I. Isolation of Partitions from Structure: Where partitions abut ceiling or deck construction or vertical structure elements, provide slip or cushion-type joint between partition and structure as recommended by stud manufacturer to prevent transfer of structural loads or movements to partitions.
- J. Place studs, cut to nominal height, vertically into and resting upon floor runner track. Top of studs to be inserted in to top runner track. Studs to remain friction fit until Board is screw attached. Studs immediately adjacent to openings may be crimp attached or screwed to runner track.
- K. Provide additional studs to support inside corners at partitions, intersections and corners, and to support outside corners, terminations of partitions, both sides of control joint (if any) and adjacent to all openings.
- L. Where special conditions requiring extra stiff partition systems are indicated on Drawings or required, provide additional studs, in sizes indicated.
- M. Provide framed openings for installation of recessed, semi recessed, or penetration of items. Provide additional Horizontal and vertical blocking members where necessary, to receive attachments for shelves, cabinets, garment hooks and other surface mounted items including toilet compartments, toilet room accessories, electrical and telephone panels and boards, etc., and reinforcement at fixture hangers.
- N. Stud splicing is not permissible.
- O. Maintain clearance under structural building members to avoid deflection transfer to non-load bearing studs.
- P. **Six inch studs or chase wall shall be used where necessary to conceal pipes, to receive fire extinguisher cabinets, electrical panels, etc. These walls shall run from inside corner to inside corner of the room.**

3.02 DOOR FRAMES

- A. Where doors and cased openings are shown or scheduled, provide two 16 gage studs at each jamb and one additional 20 gage stud not more than six inches from jamb studs. Fasten jamb studs to metal frames with anchor clips using two self-tapping screws or bolts per clip. Where wood frames are shown, fasten jamb studs to rough framing with screws.
- B. Anchor strut studs to floor and ceiling runners with 3/8 inch type "S" at each flange intersection.
- C. Install heads formed from track, miter cut and bend 90 at each end to abut against strut studs.
- D. Anchor door frames with 3/8 inch Type S-12 screws driven through header and strut studs into frame anchor clips.
- E. For heavy oversize doors, install horizontal reinforcing channels in pairs at each side of door jamb and positioned 8 inches from head and floor and at mid-height.
- F. Securely tie these aligning channels to inside of stud chord at each intersection.
- G. Fill door frames solid with mixture of concrete and sand.

3.03 CEILING ERECTION

- A. Space 9 gage hanger wires 48 inch o.c. along carrying channels and within 6 inches of ends of carrying channel runs.
- B. In concrete, anchor hangers by attachment to reinforcing steel, by loops embedded at least 2 inches or by approved inserts.
- C. For steel construction, wrap hanger around or through beams or joints.
- D. Install 1-1/2 inches carrying channels 48 inches o.c. - 24 inches for fire rated construction and within 6 inches of walls.
- E. Position channels for proper ceiling height, level and secure with hanger wire saddle tied along channel.
- F. Provide 1 inch clearance between runners and abutting walls and partitions.
- G. At channel splices, interlock flange overlap ends 12 inches and secure each end with double strand 16 gage tie wire.
- H. At light troffers or any openings that interrupt the carrying or furring channels, install additional cross reinforcing to restore lateral stability of grillage.

3.04 TOLERANCES

- A. Install members to provide surface plane with maximum variation of 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09206
METAL FURRING AND LATHING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Wall and furred space framing.
- B. Metal lathing for wet plaster finish.

1.02 RELATED WORK

- A. Section 05100 - Miscellaneous Structural Steel
- B. Section 09220 - Cement Plaster.

1.03 REFERENCES

- A. ANSI/ASTM aC841 - Installation of Interior Lathing and Furring.
- B. ANSI/ASTM C847 - Metal Lath.
- C. FS QQ-L-101 - Lath, Metal, and other Metal Plaster Bases.
- D. ML/SFA Metal Lath/Steel Framing Association - Specifications for Metal Lathing and Furring.

1.04 SYSTEM DESCRIPTION

- A. Fabricate vertical wall and furred space framing to limit finish surface to 1/180 deflection under lateral point load of 100 lbs.
- B. Fabricate horizontal ceiling and soffit framing to limit finish surface to 1/360 deflection under superimposed dead loads and wind uplift.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with ANSI/ASTM C84 and ML/SFA - Specifications for Metal Lathing and Furring.

1.06 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Provide product data on furring and lathing components, structural characteristics, material limitations and finish.

1.07 COORDINATION

- A. Coordination work of this Section with installation of hollow metal frames.
- B. Coordinate the installation of bucks, anchors, blocking, and electrical and mechanical work which is to be placed in or behind framing, furring, and lathing.

PART 2 - PRODUCTS

2.01 FRAMING MATERIALS

- A. Furring Channels: Formed steel; minimum 25 gage thick, 3/8 inch deep ax 3/4 inch high; length as required.
- B. Main Ceiling Channels: Formed steel; minimum 18 gage thick, 3/4 inch deep x 1-1/2 inch high; length as required.
- C. Hangers: Galvanized steel, of size and type to suit application, to rigidly support ceiling components in place, with maximum deflection as indicated, 8 gage wire minimum.
- D. Lateral Bracing: Formed steel; minimum 16 gage thick; size and length as required.
- E. Casing Bead: Formed sheet steel; minimum 25 gage thick; thickness governed by plaster thickness; maximum possible lengths; expanded metal with square edges.
- F. Control and Expansion Joint Accessories: Formed sheet steel; minimum 25 gage thick; accordian profile, 2 inch expanded metal flanges each side.
- G. Anchorage and Fastening Device: Approved devices of type and size to suit application; to rigidly secure ceiling furring members in place.

2.02 LATHING MATERIALS AND ACCESSORIES

- A. Metal Lath: ANSI/ASTM C847; FS QQ-L-101; flat diamond self-furring mesh or flat rib, 3/8 inch high. Lath to be 3.4 lb.
- B. Corner Mesh: Formed sheet steel; minimum 26 gage thick; perforated flanges shaped to permit complete embedding in plaster; minimum 2 inch size.
- C. Strip Mesh: Expanded metal lath, minimum 26 gage thick; 2 inch wide x 24 inch long.
- D. Anchorages: Tie wire, nails, screws and other metal supports, of type and size to suit application; to rigidly secure lathing materials in place.
- E. Control Joints

2.03 FINISHES

- A. Framing Materials: Galvanized
- B. Hangers, Anchors, and Fastening Devices: Galvanized
- C. Lath Materials: Galvanized

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that surfaces conditions are ready to receive work.
- B. Beginning of installation means acceptance of existing surfaces and substrate.
- C. In cold weather maintain the building temperature at a temperature range of 55 degrees F to 60 degree F. Caution should be taken to avoid higher temperatures which promote rapid drying conditions and are detrimental to plaster. Maintain air circulation at a minimum level for twenty-four hours prior to, during and after finishing until surface is dry.

3.02 CEILING AND SOFFIT FRAMING

- A. Install furring to height indicated. Erect after above ceiling work is complete. Coordinate the location of hangers with other work.
- B. Install ceiling furring independent of walls, columns, and above ceiling work. Securely anchor hangers to structural members or embed in structural slab. Space hangers to achieve deflection limits indicated.
- C. Space main carrying channels at maximum 48 inch centers; not more than 6 inches from wall surfaces. Lap splice securely.
- D. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- E. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splice securely. Space furring channels at not more than 16 inches o.c. Saddle tie channels to runners with 16 gage tie wire.
- F. Reinforce openings in suspension system which interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- G. Laterally brace suspension system.
- H. Erect resilient channels at maximum inches on center. Rigidly secure in place.
- I. Establish contraction, control, and expansion joints with back to back casing beads set 1/4 inch. Set both beads over 6 inch wide strip of polyethylene sheet for air seal continuity.
- J. Where indicated on drawings, attach USG control joints with dry wall screws or Bostitch 9/16 inch "G" staples or equal, spaced not over six inch apart in each flange. Splice ends together with 16 gage tie wire inserted into openings in the key-lock sections. remove protective tape after plastering.
- K. Interior Walls and Partitions: Space control joints maximum of 30 feet apart; control joints occur over door frames at each jamb.
- L. Exterior Soffits of Gypsum Plaster: Space control joints not exceeding 25 feet in either direction. Break lath and channel behind control joints. All other specifications listed above

are applicable.

- M. Exterior Walls, Soffits and Canopies of Portland Cement Stucco: Space control joints not exceeding 10 feet in either direction. Where there is an intersection of vertical and horizontal joints, use continuous horizontal joint and butt the vertical joint. Caulk splices and intersections exposed to the elements with a silicone rubber caulking cement. In soffits and canopies, break lath and channel behind control joints.

3.03 LATHING MATERIALS

- A. Apply on ply of 30 lb. Felt underlayment over substrate; weather lap edges 4 inches minimum. Fasten in place.
- B. Apply metal lath taut, with long dimension perpendicular to supports.
- C. Lap ends minimum one inch. Secure end laps with tie wire where they occur between supports.
- D. Lap sides of diamond mesh lath minimum 1-1/2 inches. Nest outside ribs or rib lath together.
- E. Attach metal lath to metal supports using tie wire at maximum 6 inches on center.
- F. Attach metal lath to concrete using appropriate metal fasteners at maximum 12 inches each way on center.

3.04 TOLERANCES

- A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.
- B. Maximum Variation from True Position: 1/8 inch.

3.05 INTERSECTING SURFACES

- A. Provide accessory mouldings and trim of type indicated at intersections of plastered surfaces with other materials and at intersections of walls and ceilings as shown on Drawings and as required to complete plaster work.
- B. Reinforce internal angles formed by metal lath by Cornerite wire tied over the abutting lath.
- C. Finish plaster surfaces which intersect exposed masonry or metal construction with casing bead.
- D. Wherever plaster comes in contact with steel, steel surface shall be given one coat of exterior grade varnish.

END OF SECTION

Section 09220
CEMENT PLASTER

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Portland cement plaster system on galvanized lath.

1.02 SYSTEM DESCRIPTION

- A. Fabricate vertical elements to limit finish surface to 1/180 deflection under lateral point load of 100 lbs.
- B. Fabricate horizontal elements to limit finish surface to 1/360 deflection under superimposed dead loads and wind lift loads.

1.03 QUALITY ASSURANCE

- A. Apply cement plaster in accordance with ASTM C926 and PCA Plaster Stucco Manual.

1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Provide product data on plaster materials, characteristics and limitations of products specified.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply plaster when substrate or ambient air temperature is less than 50 degrees F nor more than 80 degrees F.
- B. Maintain minimum ambient temperature of 50 degrees F during and after installation of plaster.

1.06 REFERENCES

- A. American Society for Testing and Materials
 - 1 ASTM C150 - Standard Specification for Portland Cement.
 - 2 ASTM C206 - Standard Specification for Finishing Hydrant Line.
 - 3 ASTM C897 - Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
 - 4 ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
 - 5 ASTM C932 - Standard Specification for Surface-Applied Bonding Agents for Exterior Plastering.
 - 6 ASTM C933 - Standard Specification for Welded Wire Lath.
 - 7 ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
 - 8 ASTM C1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Plaster Bases.
 - 9 ASTM C1032 - Standard Specification for Woven Wire Plaster Base.
 - 10 ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

- 11 ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
- 12 ASTM C1328 - Standard Specification for Plastic(Stucco) Cement.
- 13 ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

PART 2 - PRODUCTS

2.01 PLASTER BASE COAT MATERIALS (Scratch and Brown Coats)

- A. Cement: ASTM C150, Normal - Type 1 Portland Cement.
- B. Lime: ANSI/ASTM C206, Type S; C207, type S.
- C. Aggregate Sand: In accordance with ANSI/ASTM C897 and PCA Plaster Manual.
- D. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.
- E. Bonding Agent: ASTM C932 type recommended for bonding plaster to concrete or concrete masonry.
- F. Fibers: ½" nominal length glass fibers meeting requirements of ASTM C1116.

2.02 PLASTER FINISH COAT MATERIALS

- A. Aggregate Textured 100% Acrylic-based Finish by DPR Finish by Dryvit, Master Wall, Inc., Sto Finish Systems or approved equals.
- B. Finish shall be trowel applied at no less than 1/16" thickness or thicker depending on texture to be selected by Architect: Quartzputz, Sandblast or Sandpebble.
- C. Acrylic Plaster finish shall meet the following:
 - Moisture Resistance per ASTM D2247: no deleterious effects after 14 day exposure
 - Salt Spray Resistance per ASTM B117: no deleterious effects after 300 hours
 - Accelerated Weathering per ASTM G155: no deleterious effects after 5000 hours
 - Mildew Resistance per Mil STD 810B: passes
 - Flame Spread per ASTM E84: less than 25 (Class 1)
- D. **Color as selected by Architect.**
- E. Finish coating to be mixed and applied per manufacturer's recommendations.
- F. Cement, Lime and Water shall meet same standards as those for Base Coat above.

2.05 FURRING AND LATHING

- A. See Section 09206

2.06 CEMENT PLASTER MIXES

- A. Mix and proportion cement plaster in accordance with ANSI/ASTM C926 manufacturer's instructions: Fiber Reinforcement: Add glass fibers to base coats at a rate of 94# per sack of cement.
- B. Mix materials dry, to uniform color and consistency, before adding water.

- C. Protect mixtures from frost, contamination and excessive evaporation.
- D. Do not retemper mixes after initial set has occurred.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Grounds and Blocking: Verify items within walls for other Sections of work have been installed.
- C. Mechanical and Electrical: Verify services within walls have been tested and approved.
- D. Beginning of installation means acceptance of existing conditions.
- E. Refer also to section 09602 for furring and lath installation. Plastering shall not start until last is flat, secured to substrate and joint and surface perimeter accessories are in place.

3.02 PREPARATION

- A. Protect surfaces near the work of this Section from damage or disfiguration.
- B. Where existing plaster surfaces are to receive new finish coat, thoroughly clean, deoxidize then coat with a bonding agent recommended by the manufacturer.
- C. Where concrete surfaces are to receive plaster, clean with acid solutions solvents or detergents and thoroughly rinse before installing plaster.

3.03 CONTROL AND EXPANSION JOINTS

- A. Locate exterior control joints every 12 feet in each direction unless indicated on reflected ceiling plan otherwise and at each change in direction. Contact Architect for pattern if not shown on drawings.
- B. Establish control and expansion joints with specified joint device.
- C. Coordinate joint placement with existing joints and other related work. (Section 09206)
- D. Refer to 09206 for casing beads and metal control joints.
- E. Refer to manufacturer's recommendations for joints with sealants: provide a color prime applied over base coat in the joint.

3.04 PLASTERING

- A. Apply plaster in accordance with ASTM C926 manufacturer's instructions.
- B. Apply scratch coat to a nominal thickness of 3/8 inch, brown coat to a nominal thickness of 3/8 inch, and a finish coat to a nominal thickness of 1/8 inch over metal lathed self-furring reinforcement? (Typical for exterior applications).
- C. Apply brown coat to a nominal thickness of 3/8" and a finish coat to a nominal thickness of 1/8"

over masonry interior surfaces. *Not anticipated in this project.*

- D. Moisture scratch and brown coats. Apply brown coat immediately following initial set of scratch coat.
- E. After curing, dampen base coat prior to applying finish coat.
- F. Apply finish coat to a fine sand float texture (or options texture to be selected) with selected color.
- G. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface. Not less than 24 hours between each application.
- H. Moist cure finish coat for minimum period of 48 hours.

3.05 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

3.06 REPAIR

- A Remove damaged or defective plaster by cutting and replace with specified materials to match adjacent plaster.
- B Fog coat non-uniform or discolored plaster with finish coat surface.
- C Where gypsum plaster is repaired use a bonding agent equal to plaster weld, by Larson Products. Where Portland Cement Plaster is repaired, use a product equal to weldcrete by Larson Products or equal.

END OF SECTION

SECTION 09260
GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Metal channel ceiling framing.
- B. Gypsum board.
- C. Taped and sanded joint treatment.
- D. Asphalt Felts only as indicated on Drawings.

1.02 REFERENCES

- A. ANSI/ASTM C36 - Gypsum Wallboard.
- B. ANSI/ASTM C79 - Gypsum Sheathing Board.
- C. ANSI/ASTM C442 - Gypsum Backing Board.
- D. ANSI/ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
- E. ANSI/ASTM C514 - Nails for the Application of Gypsum Wallboard.
- F. ANSI/ASTM C630 - Water Resistant Gypsum Backing Board.
- G. ANSI/ASTM C645 - Non-Load Axial Bearing Steel Studs, Runners Track, and Rigid Furring Channels for Screw Application of Gypsum Board.
- H. ANSI/ASTM C646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.
- I. ANSI/ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
- J. GA-201 - Gypsum Board for Walls and Ceilings.
- K. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

1.03 SYSTEM DESCRIPTION

- A. Acoustic Attenuation for Identified Interior Partitions: 45-51 STC in accordance with ANSI/ASTM E90.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate on shop drawings, special details associated with fireproofing and acoustic seals.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. United States Gypsum Co.
- B. National Gypsum Co.
- C. Georgia-Pacific
- D. Substitutions: Under provision of Section 01600 and Instructions to Bidders.

2.02 GYPSUM BOARD MATERIALS

- A. Fire Rated Gypsum Board: ANSI/ASTM C36; fire resistive, and moisture resistant type, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges. All board to be mold and mildew resistant.
- B. Moisture Resistant Gypsum Board: ANSI/ASTM C630; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges. (Fire Rated Gypsum Board). This shall be used at all toilet rooms, mens rooms, womens rooms, housekeeping rooms, and/or as indicated on Drawings. All board to be mold and mildew resistant.
- C. Exterior Sheathing Board: 5/8" exterior sheathing approved for **application with exterior wall system**. (Seal all joints continuous). Substrates shall be manufactured by one of the following:
 - 1.) Dens-Glass Gold by G-P Gypsum.
 - 2.) 5/8" Fiberrock Sheathing by USG.
 - 3.) Substitutions: per Section 01600 and Instructions to Bidders

2.03 ACCESSORIES

- A. Corner Beads: Metal
- B. Edge Trim: GA 201 and GA 216
- C. Joint Materials: ANSI/ASTM C475; GA 201 and GA 216; reinforcing tape, joint compound, adhesive, water, and fasteners.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing surfaces and substrate.

3.02 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 201 and GA 216 manufacturer's instructions.
- B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.

- C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- D. Use screws when fastening gypsum board to metal furring or framing.
- E. Double Layer Applications: Use gypsum backing board for first layer, placed perpendicular to framing or furring members. Use fire rated gypsum backing board for fire rated partitions. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.
- F. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum ceiling board with sealant.
- G. Place **control joints** consistent with lines of building spaces as specified unless shown otherwise on Drawings. Place control joints on both sides of all window heads and door heads extending to deck or top of wall. Place control joints on **interior partitions and ceilings at a maximum spacing of 30 feet and as recommended by latest edition of USG Construction Handbook.**
- H. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board butts dissimilar materials as indicated.

3.03 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. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.
- D. Taping, filling, and sanding shall be required for existing surfaces which may be damaged due to the removal of existing VWC or construction activities.
- E. Install acoustical sealant on all partitions in strict accordance with manufacturer's printed instructions and recommendations. (NOT TO BE USED with PVC.)
- F. **All of the above shall be done to meet the - Level 4 - recommended specifications of the AWCI** included in GA 214-90: All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads and accessories..

3.04 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09305
TILE SETTING MATERIALS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Edge-protection and transition profiles for floors.
- B. Finishing and edge-protection profiles for walls and countertops.
- C. Movement joint and cove-shaped profiles.
- D. Modular screed system.
- E. Uncoupling membrane.
- F. Waterproofing Membrane.
- G. Floor drain, with integrated bonding flange.
- H. Shower waterproofing: prefabricated substrates, waterproofing membrane, floor drain with integrated bonding flange, and sealant.
- I. Drainage membranes.
- J. Setting materials: adhesives, mortars, grouts, and sealants.
- K. This section applies to all patient & public toilet rooms.

1.2 REFERENCES

- A. CSA B79-08: Floor, Area, and Shower Drains, and Cleanouts for Residential Construction.
- B. IAPMO IGC 195: Interim Guide Criteria for Floor Drain with Integrated Bonding Flange.
- C. Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation.
- D. Terrazzo, Tile and Marble Association of Canada (TTMAC) Specification Guide 09300 Tile Installation Manual.
- E. American National Standard Specifications for the installation of ceramic tile A108 / A118 / A136.1.

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. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.

- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.
- B. Source Limitations for Setting Materials and Accessories: Obtain product of a uniform quality for each application condition from a single 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.
- D. Preinstallation Conference: Conduct conference at the Project site.
 - 1. Convene one week prior to commencing work of this section.
 - 2. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work. Review installation procedures and coordination required with related work.
 - 3. Meeting agenda includes but is not limited to:
 - a. Surface preparation.
 - b. Tile and installation material compatibility.
 - c. Edge protection, transition and pre-fabricated movement joint profiles.
 - d. Waterproofing techniques.
 - e. Crack isolation techniques.

1.5 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.

1.6 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 COORDINATION

- A. Coordinate Work with other operations and installation of floor finish materials to avoid damage to installed materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. ASD. Tel: (800) 472-4588. Fax (800) 477-9783. E-mail: specassist@schluter.com. Web: www.schluter.com.
- B. Acceptable Manufacturer: Schluter Systems (Canada) Inc., 21100 Chemin Ste-Marie, Ste-

Anne-de-Bellevue, QC H9X 3Y8. Tel: (800) 667-8746. Fax (514) 336-2410. E-mail: specassist@schluter.com. Web: www.schluter.ca.

- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 EDGE-PROTECTION AND TRANSITION PROFILES FOR FLOORS

- A. Schluter-DECO
 - 1. Description: profile with 1/4 inch (6 mm) wide visible surface and integrated trapezoid-perforated anchoring leg.

2.3 FINISHING AND EDGE-PROTECTION PROFILES FOR WALLS AND COUNTERTOPS

- A. Schluter-JOLLY
 - 1. Description: L-shaped profile with 1/8 inch (3.2 mm) wide top section vertical wall section that together form the visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
 - 2. Anchoring Leg:
 - a. Provide with straight anchoring leg.
 - 3. Material and Finish:
 - a. MC - Chrome-plated Solid Brass.
 - 1) Height as required to coordinate with tile selection and setting system selected.
- B. Schluter-QUADEC
 - 1. Description: profile with square visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
 - 2. Corners:
 - a. Provide with matching inside corners.
 - b. Provide with matching outside corners.
 - c. Provide with internal connectors.
 - 3. Material and Finish:
 - a. E - Stainless Steel Type 304 = V2A.
 - 1) Height as required to coordinate with tile selection and setting system selected.

2.4 MOVEMENT JOINTS AND COVE-SHAPED PROFILES

- A. Schluter DILEX-AHK
 - 1. Description: anodized aluminum profile with integrated trapezoid-perforated anchoring leg, connected at a 90-degree angled by a cove-shaped section with 3/8" radius that forms the visible surface.
 - 2. Corners:
 - a. Provide with matching inside and outside corners.
 - b. Provide with matching end caps.
 - c. Provide with matching connectors.
 - 3. Material and Finish
 - a. As selected by Architect from manufacturer's selection.
 - 4. Height: as required.

2.5 UNCOUPLING MEMBRANE

- A. Schluter-DITRA
 - 1. Description: 1/8 inch (3 mm) thick, orange, high-density polyethylene membrane with a grid structure of 1/2 inch by 1/2 inch (12 mm by 12 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its

underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation and is listed by cUPC to meet or exceed the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).

2. Waterproofing seaming membrane:
 - a. Provide **KERDI BAND** Seams and Corners material **0.004 inch (4 mil)** thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.

B. Schluter-DITRA-XL

1. Description: **5/16 inch (7 mm) thick**, orange, high-density polyethylene membrane with a grid structure of 1/2 inch by 1/2 inch (12 mm by 12 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation and listed by cUPC to meet or exceed the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).
2. Waterproofing seaming membrane:
 - a. Provide KERDI BAND Seams and Corners material 0.004 inch (0.1 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.

2.6 WATERPROOFING MEMBRANE

A. Schluter-KERDI

1. Description: **0.008 inch (8 mil) thick**, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which is listed by cUPC to meet or exceed requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by cUPC, and is evaluated by ICC-ES (see Report No. ESR-2467).
2. Corners and seals:
 - a. Provide matching preformed inside corners.
 - b. Provide matching preformed outside corners.
 - c. Provide matching preformed pipe seals.
 - d. Provide matching preformed mixing valve seals.

2.7 FLOOR DRAIN WITH INTEGRATED BONDING FLANGE

A. Schluter-KERDI-LINE DRAIN, Brushed Stainless Steel:

1. Description:
 - a. Linear (trench type) floor drain consisting of a formed stainless steel channel body and grate assembly that can be seamlessly adjusted to tile or stone covering thickness from 1/8 inch (3 mm) to 1 inch (25 mm). The channel body features a 2-1/4 inch (57 mm) wide trough, a 2 inch (50 mm) no-hub outlet and a 7/8 inch (22 mm) wide bonding flange laminated with a collar made of the Schluter-KERDI waterproofing membrane. Drain type as referenced in methods B422 and B422 STONE in the Tile Council of North America Handbook for Ceramic, Glass, and Stone Tile Installation. **NOTE: The position of the non-hub outlet is typically required at the center position, but there will be instances where an offset outlet position will be required to avoid obstructions with structural framing, etc. Contractor shall coordinate**

drain outlet position in the field as required to avoid obstructions.

2. Channel Body Material:
 - a. Stainless Steel 304 (1.4301 = V2A).
3. Grate Frame Height:
 - a. Height as required.
4. Grate Design:
 - a. EB – Closed Solid Brushed Stainless Steel Type 304=V2A.

2.8 WATERPROOF BUILDING PANEL FOR CERAMIC AND STONE TILE

- A. Schluter-KERDI-BOARD
 1. Description: Rigid extruded polystyrene foam building element panel, with reinforcement material and polypropylene fleece webbing laminated on both sides for thin-set ceramic tile and dimension stone Installations.
 2. Panel Thickness:
 - a. Thickness: 5/8".

2.9 DRAINAGE MEMBRANES

- A. Schluter-TROBA-PLUS
 1. Description: orange polyethylene sheet with 5/16 inch (8 mm) high, truncated cone-shaped studs, covered with a polypropylene water-permeable filter fabric.

2.10 SETTING MATERIALS

- A. Schluter-**ALL- SET Mortar**.
 1. Description: specialized sag-resistant modified thin-set mortar specifically formulated for use with Schluter membranes and boards. Schluter-SET is suitable for use with ceramic, porcelain, and stone tile, including large and heavy tile, in conjunction with Schluter-Systems' uncoupling and waterproofing membranes. Meets the requirements of ANSI A118.4T, A118.11 and A118.15T.
 2. Color: White or Grey as selected by Architect.

2.11 ACCESSORIES

- A. Furnish and install all accessories as required for a complete and ready to use installation.
- B. In addition to specific requirements outlined in this section furnish and install other items that are indicated on drawings such as inside/outside corner trims and floor cove trims.
- C. See Sections 06650 and 09311 for threshold requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 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 printed instructions and recommendations.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09311
CERAMIC TILE FLOOR AND WALL FINISH
(PORCELAIN TILE)

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Ceramic tile floor with cementitious & epoxy grouted joints.
- B. Solid Surface thresholds in wall openings.
- C. Ceramic tile walls.
- D. Coordination and installation of materials specified in **Section 09305**.

1.02 QUALITY ASSURANCE

- A. Conform to ANSI - American National Standard Specifications for the Installation of Ceramic Tile.
- B. Conform to ANSI - Recommended Standard Specifications for Ceramic Tile - Tile Council of America 137.1.

1.03 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
- C. Submit product data, specifications, and instruction for using adhesives and grouts.
- D. Submit manufacturer's certification under provisions of Section 01400 that tile materials supplied conform to TCA 137.1.

1.04 MAINTENANCE DATA

- A. Submit maintenance data under provisions of Section 01700.
- B. Include cleaning methods, cleaning solutions recommended, stain removal methods, and polishes and waxes recommended.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions

PART 2 -PRODUCTS

2.01 ACCEPTABLE TILE MANUFACTURERS

- A. American Olean
- B. Dal-Tile

- C. Substitutions: See Instructions to Bidders and Section 01600 - Substitutions

2.02 FLOOR TILE MATERIALS

- A. Ceramic Mosaic Floor Tile: TCA 137.1; 0 to 0.5 percent water absorption;
 - a. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**
 - b. Substitutions: per Article 4.3 of Instructions to Bidders and Section 01600.
- B. Thresholds:
Solid Polymer Fabrications (Corian) Color as selected by Architect bevelled one side, radiused edges from bevel to vertical face. **(RE: Section 06650)** Size by full width of wall or frame opening- Threshold to be one continuous piece with **NO JOINTS. Submit samples for approval.**

2.03 CERAMIC WALL TILE MATERIALS

- A. Ceramic Mosaic Wall Tile Align with Floor Joints:
TCA 137.1; 0.5 to 3.0 percent water absorption, 6" x 6" x 1/4" size; square edge, glazed finish, color to be selected.
- B. Base at Wall Tile: TCA 137.1; 0.5 to 3.0 percent water absorption;
 - 1. Approved Manufacturer's:
 - a. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**
 - b. Substitutions: per Article 4.3 of Instructions to Bidders and Section 01600.
- C. Base at Painted Walls: Same as B in sanitary cove shape.
- D. Mosaic Trim Shapes: Provide all required trim shapes as follows:
 - 1. Rounded external corners (3/4 inch radius).
 - 2. Trim shapes at head jambs and sill of openings.
 - 3. Internal corners-field-buffed square, except use square corner, combination angle and stretcher type cap.
 - 4. Bullnose caps as required.

2.04 SETTING MATERIALS - CERAMIC TILE

- A. Epoxy Grout - ANSI A118.3
- B. Dry - Set or Latex - Portland cement mortar bond coat.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install ceramic floor and base in accordance with Tile Council of America, Inc. Specification F114-96 Cement Mortar, Epoxy or Furan Grout. Tile Set by Method F111 for Heavy Performance. Showers shall be similar to B415-96 with epoxy grout.
- C. Install ceramic wall tile and base in accordance with Tile Council of America, Inc., Specification W223-88 Organic Adhesive. Install Grout in accordance with ANSI 108.10; Install tile in accordance with ANSI A108.4.
- D. Verify pattern is uninterrupted through openings.
- E. Align all floor tile joints with wall tile joints.

- F. Provide thresholds at wall or frame openings to other building areas not receiving ceramic tile floor finish.
- G. Cut and fit tile tight to protrusions and vertical interruptions. Form corners and bases neatly.
- H. Work tile joints uniform in width, subject to variance in tolerance allowed in tile size. Joints: Watertight, without voids, cracks, excess mortar, or grout.
- I. Sound tile after setting. Replace hollow sounding units.
- J. Keep expansion/contraction control joints free of mortar or grout.
- K. Allow tile to set for a minimum of 48 hours prior to grouting.

3.02 PROTECTION

- A. Prohibit traffic from floor finish for 48 hours after installation.

END OF SECTION

SECTION 09511
SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Suspended metal grid ceiling system.
- B. Acoustical tile.
- C. Vinyl Faced Gypsum Units.
- D. Non-fire rated assembly.
- E. Perimeter trim.

1.02 RELATED WORK

- A. Wet-Pipe Sprinkler Systems: Sprinkler heads in ceiling system.
- B. Air Outlets and Inlets: Air diffusion devices in ceiling system.
- C. Building Lighting: Light fixtures in ceiling system.

1.03 REFERENCES

- A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Provide product data on metal grid system components, and acoustic units.
- C. Submit samples under provisions of Section 01300.
- D. Submit two samples full size 24 x 24 inch in size, illustrating material and finish of acoustic units.
- E. Submit two samples each, 12 inches long, of suspension system main runner, cross runner and edge trim.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature of minimum 60 degrees F, and humidity of 20 to 40 percent prior to, during, and after installation.

1.06 SEQUENCING/SCHEDULING

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Schedule installation of acoustic units after interior wet work is dry.

1.07 EXTRA STOCK

- A. Provide extra quantity of acoustic units under provisions of Section 01700.
- B. Provide cartons of extra tile, panels, and metal pans to Owner.

PART 2 - PRODUCTS

2.01 ALL MANUFACTURERS - CEILING GRIDS

- A. Chicago Metallic Corp.
- B. Armstrong World Industries, Inc.
- C. USG Interiors, Inc.
- D. Substitutions: Under provisions of Section 01600 and Instruction to Bidders.

2.02 SUSPENSION SYSTEM MATERIALS

- A. Grid: ASTM C635, intermediate duty, non-fire rated exposed T; components die cut and interlocking.
- B. Accessories: Stabilizer bars, clips, edge and moldings required for suspended grid system. Provide hold down clips where indicated on Drawings.
- C. Grid Materials: Commercial quality hot dipped galvanized steel.
- D. Grid Finish: Aluminum cap with standard white finish.
- E. Support Channels and Hangers: Hot dipped galvanized steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

2.03 ACCEPTABLE MANUFACTURERS - ACOUSTIC UNITS

- A. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**
- B. Substitutions: See Instructions to Bidders and Section 01600 Material and Equipment: Substitutions.

2.04 ACOUSTIC UNIT MATERIALS-

- A. Acoustic Panels: Conforming to the following:
 - 1. Size: 24 x 24 inches
 - 2. Thickness: 5/8 inches
 - 3. Composition: Mineral
 - 4. Light Reflectance: 83 percent
 - 5. NRC Average: .55
 - 6. CAC (Ceiling Attenuation Class) : minimum 33.
 - 7. Flame Spread 0-25 ASTM E84
 - 8. Edge: Square
 - 9. Surface Color: White
 - 10. Surface Finish: Perforated Non Directional Pattern
 - 11. Sag Resistant.

2.07 MAINTENANCE STOCK

- A. Furnish full size units matching the units installed packaged with protective covering for storage, and identified with appropriate labels. Furnish **one percent** of the amount installed.

2.08 VINYL FACED GYPSUM BOARD PANEL-

- A. Type: Provide panels which are approved for kitchen use by USDA.
- B. Pattern: Panel characteristics as follows:
 - 1. Color/Light Reflectance Coefficient: White/LR 0.80.
 - 2. Edge Detail: Square
 - 3. Size: 24 inches by 24 inches by 1/2 inch.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that existing conditions are ready to receive work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install system in accordance with ASTM C636 manufacturer's instructions and as supplemented in this Section.
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- D. Supply hangers or inserts for installation to Section with instructions for their correct placement. If metal deck is not supplied with hanger tabs, coordinate the installation of hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- E. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. **Center system on room axis leaving equal border units according to reflected plan. Do not use less-than-half width units at borders. Where layouts will not allow less-than-half units, use 2 x 4 foot units and cut units as required.**
- H. Do not eccentrically load system, or produce rotation of runners.
- I. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. provide edge moldings at junctions with other interruptions. Field rabbett tile edge. Where round obstructions occur, provide preformed closers to match edge molding.
- J. Form expansion joints as detailed. Form to accommodate plus or minus one inch movement. Maintain visual closure.
- K. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- L. Install acoustic units level, in uniform plane, and free from twist, warp and dents.
- M. Install hold-down clips to retain panels tight to grid system where shown on plans.

N. Furnish four hangers, one at each corner of each light fixture.

3.03 TOLERANCES

A. Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Variation from Plumb of Grid Members Caused by Eccentric Loads: Two degrees maximum.

C. Laser - level all ceilings.

END OF SECTION

SECTION 09650
RESILIENT FLOORING

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 work of this Section.
- B. Grinding and floating existing uneven slabs to receive finished flooring with no more than 1/8" in 10' out of level. Grinding of this slab and infill may be required to provide the necessary level finish. *There will be no extra processed for either patching or grinding of topping or for floor floating to level existing or new floors.*
- C. Where new flooring is called for in existing areas, the existing finish floor shall be removed down to concrete slab prior to application.

1.02 DESCRIPTION OF WORK

- A. Extent of resilient flooring and accessories is shown on Drawings and in schedules.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, and sealants.
- B. No materials shall contain asbestos.

1.04 SUBMITTALS

- A. Submit shop drawings and product data under provision of Section 01300.
- B. Product Data: Submit two copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.
- C. Samples: Submit three sets of samples of each type, color, and finish of resilient flooring and accessory required, indicating full range of color and pattern variation. Provide full-size tile units, 12 inches square samples of sheet flooring, and 6 inches long samples of accessories.
- D. Maintenance Instructions: Submit two copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.05 JOB CONDITIONS:

- A. Maintain minimum temperature of 65 degrees F in spaces to receive resilient flooring for at least 40 hours prior to installation, during installation, and for not less than 48 hours after installation. Subsequently, maintain minimum temperature of 55 degrees F in areas where work is completed.
- B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Moisture content of concrete slabs and environmental conditions must be within limits recommended by manufacturer of products being installed.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - VINYL FLOOR AND BASE- **(RE:SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.)**

- A. Vinyl Tile - (As required to match existing due to demolition and new areas as scheduled.) Contractor shall supply all necessary materials other than the tile for a complete installation.
 - 1. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**
 - 2. Color - As selected by Architect.
- B. Sheet Vinyl Flooring & Base -
 - 1. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**
 - 2. Seams: **Heat Welded. (Weld color coordinated with flooring.)**
 - 3. Base: **6" Cove Base (with metal "Flash Cove"reinforced back-up plate) welded integral with floor.**
 - 4. Provide in multiple colors and patterns as selected by Architect.
- C. Resilient Base - (As required to match existing due to demolition and new areas as scheduled.) Contractor shall supply all necessary materials other than the tile for a complete installation.
 - 1. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**
 - 2. **Finish /Color as selected by Architect.**
 - 3. Lengths : Seamless , 120 foot rolls. (Use pre formed outside corners.)
- D. Luxury Vinyl Tile - Contractor shall supply all necessary materials other than the tile for a complete installation.
 - 1. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN..**

2.02 MATERIALS

- A. Colors and Patterns: As shown or scheduled.
- B. Vinyl Tile:
 - 1. In addition to that required for installation, provide for Owner's use one carton of each color and pattern used. (Four cartons)
- C. Adhesives: Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
- D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- E. Leveling Compound if required to level slab.
 - 1. Mapai Novaplan or M20
 - 2. Dura-Cap or Level-Right Plus by Maxxon Corporation

2.03 MAINTENANCE STOCK

- A. At time of completing the installation, deliver stock of maintenance material to the Owner. Furnish full size units matching the units installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish an amount equal to 1 percent of each type tile installed.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer must examine areas and conditions under which resilient flooring and accessories are to be installed and must notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Where new flooring is called for in existing areas, the existing finish floor shall be removed down to concrete slab prior to application.
- C. Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no "dusting" through installed carpet; apply sealer where required to prevent dusting.
- D. Sequence flooring with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period

3.02 PREPARATION

- A. Broom Clean or vacuum surfaces to be covered, and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.
- B. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors. Contractor shall be required to provide all leveling as may be required due to the removal of existing finish floor materials. If the removal process removes existing leveling compounds, contractor shall replace accordingly or as may be required for proper, level installation.
- C. Perform moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and ready to receive flooring. **Test shall be documented in writing and approved by Manufacturer's Representative prior to flooring installation. This contractor is responsible for applying a penetrating moisture blocker if required to accommodate flooring specifications for moisture content. If not used the credit for this moisture blocker will be returned to the owner. Product shall be compatible with concrete, it's admixtures and the floor tile adhesive.**
- D. Apply concrete slab primer, if recommended by flooring manufacturer prior to application of adhesive. Apply in compliance with manufacturer's directions.
- E. Correct alignment of partitions as required for proper transition from floor to base.
- F. Substrates must be dry, clean, smooth, and free from paint, varnish, wax, oils, solvents and other foreign matter.

In renovation or remodel work, remove any existing adhesive residue* so that 100% of the overall area of the original substrate is exposed.

Allow all flooring materials and adhesives to condition to the room temperature a minimum of 48 hours before starting the installation.

The area to receive resilient flooring should be maintained at a minimum of 65° F (18° C) and a maximum of 100° F (38° C) for 48 hours before, during and for 48 hours after completion.

3.03 INSTALLATION

- A. General: Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings, and edgings. Scribe around obstructions to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces, door reveals, and into closets and similar openings.
- B. Tile Floors:
 - 1. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
 - 2. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.
 - 3. Lay tile in "checkerboard" fashion with grain reversed in adjacent tiles. Where existing floors require new tile because of work under this contract, remove existing tile to nearest full unit and begin installation of new, which shall match existing.
- C. Apply resilient base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
- D. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.
- E. Place transition edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed. All flooring transitions shall be centered under the door in the closed position.

3.04 SHEET VINYL FLOORS

- A.. Lay and weld in strict accordance to manufacturer's printed instructions and recommendations.

3.05 FITTING

Unroll material and lay flat to allow the roll curl to relax before fitting. The lines on the back of Timberline, Translations, Perspectives, Safeguard, Safeguard Design and Safeguard Hydro represent trademark edges.

Material must be adhered within 4 hours of cutting and fitting.

Before installing the material, plan the layout so seams fall at least 6" away from subfloor/underlayment joints. Do not install over expansion joints.

When installing over an existing resilient floor, plan the layout so the new seams do not coincide with seams or joints of the existing installation.

Recommended fitting procedures include freehand knifing, straight scribing or pattern scribing

3.06 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.
 - 1. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories. Apply polish and buff with type of polish, number of coats, and buffing procedures in compliance with flooring manufacturer's instructions.

END OF SECTION

SECTION 09680
CARPETING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 - 16 Specification sections apply to work of this Section.

1.02 DESCRIPTION OF WORK:

- A. The extent of carpeting is indicated on the Drawings, and by Specifications, and is defined to include carpet and accessories.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Firm (carpet mill) whose published product literature clearly indicates compliance with requirements of this Section.
- B. General Standard: "Carpet Specifier's Handbook" by the Carpet and Rug Institute; comply with recommendations which can be reasonably applied to types of carpeting work required.
- C. Maintenance Materials: Deliver specified overrun (if any) and usable scraps of carpet to Owner's designated storage space, properly packaged (paper wrapped) and identified. Usable scraps are defined to include roll ends of less than 9'-0" length, and pieces or more than 3 sq ft area and more than 8 inches wide. Dispose of smaller pieces.

1.04 SUBMITTALS

- A. Samples, Carpeting: Submit 18 x 17 inch samples of each carpet required, and 6 inches lengths of exposed edge stripping, and other accessories.
- B. Shop Drawings: Submit plans of all areas to receive carpet, showing location of seams and accessories and direction of roll under provisions of Section 01300.

1.05 PRODUCT DELIVERY AND STORAGE

- A. Deliver carpeting materials in protective wrapping, and store inside, protected from weather, moisture and soiling.

PART 2 - PRODUCTS

2.01 CARPET ACCESSORIES

- A. Carpet Edge Guard, nonmetallic: Extruded or molded vinyl or rubber carpet edge guard of size and profile indicated; colors selected by Architect/Engineer from among standard colors available within the industry (any manufacturer).
- B. Installation Adhesive: Water-resistant type as recommended by carpet or cushion manufacturer, and which complies with flammability requirements for installed carpet.

- C. Seaming Cement: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.
- D. Miscellaneous Materials: As recommended by manufacturers of carpet, cushions and other carpeting products; and selected by installer to meet project circumstance and requirements.
- E. Maintenance Materials: Carpeting - deliver usable scraps of carpets to Owner's designated storage space, properly packaged and identified. Usable scraps are defined to include roll ends of less than 9'-0" length, and pieces of more than 3 sq ft of area and more than 8 inches wide. Dispose of smaller pieces.

2.02 MATERIAL

- A. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN..**

PART 3 - EXECUTION

3.01 PRE-INSTALLATION REQUIREMENTS

- A. Installer must examine substrates for moisture content and other conditions under which carpeting is to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no "dusting" through installed carpet; apply sealer where required to prevent dusting.
- C. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.02 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations for seam locations and direction of carpet; maintain uniformity of direction and lay of pile. At doors, center seams under doors; do not place seams in traffic direction at doorways. No tee seams will be allowed unless absolutely necessary.
 - 1. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
 - 2. Provide cut-outs where required, and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.
 - 3. Install carpet edge guard where edge of carpet is exposed; anchor guards to substrate.
 - 4. Expansion Joints: Do not bridge building expansion joints with continuous carpeting, provide for movement.
- B. Glue-Down Installation:
 - 1. Fit sections of carpet into each space prior to application of adhesive. Trim edges and butter cuts with seaming cement.
 - 2. Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt carpet edges tightly together to form seams without gaps. Roll lightly to eliminate air pockets and ensure uniform bond. Remove adhesive promptly from face of carpet.

3.03 CLEANING AND PROTECTION

- A. Remove debris, sorting pieces to be saved from scraps to be disposed of.

- B. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed.
- C. Advise Contractor of protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

END OF SECTION

SECTION 09900
PAINTS AND COATINGS

1PART GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings.
- B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
- C. **SEE INTERIOR FINISH SCHEDULE & FINISH PLAN.**

1.2 DESCRIPTION OF WORK

- A. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.
- B. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
- C. The work includes field painting of covered pipes and ducts (including color coding), and of hangers, including field cleaning and touch up, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.
- D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- E. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for factory-built mechanical and electrical equipment and accessories.
- F. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, acoustic materials, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, doors and equipment.
- G. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces, and duct shafts.
- H. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.
- I. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
- J. Do not paint over any code-required labels, such as Underwriters' Laboratories" and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

- K. **Marking of Fire and or Smoke Rated Partitions:** Mark all Fire or Smoke Rated partitions with the appropriate wording such as "1 HOUR FIRE PARTITION". Letters shall be 3 inches high and all upper case. All letters shall be painted in RED. Wording shall be spaced on each wall sections at a minimum of 10 feet on center horizontally located above finished ceilings. (Verify in field with architect.)

1.3 REFERENCES

- A. ASTM International:
1. ASTM D16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
 2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
4. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Painting and Decorating Contractors of America:
1. PDCA - Architectural Painting Specification Manual.
- E. SSPC: The Society for Protective Coatings:
1. SSPC - Steel Structures Painting Manual.
- F. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.2 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.3 SUBMITTALS

- A. Section 01300 - Submittal Procedures:
- B. Product Data: Submit data on finishing products.
- C. Samples:
1. Submit two paper chip samples, 2x3 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
 2. Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 12x 12 inch in size.
- D. Manufacturer's Installation Instructions: Submit special surface preparation procedures and substrate conditions requiring special attention.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics:
 - 1. Fire Retardant Finishes: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84 NFPA 255 UL 723.

1.6 MOCKUP

- A. Section 01400 - Quality Requirements: Mock-up requirements.
- B. Construct mockup panel, 10 feet long by 8 feet high, illustrating coating color, texture, and finish.
- C. Construct door and frame assembly illustrating paint and/or stain and varnish coating color, texture, and finish.
- D. Locate where directed by Architect/Engineer.
- E. Incorporate accepted mockup as part of Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

1.9 SEQUENCING

- A. Section 01005 - Administrative Provisions- Work sequence.
- B. Sequence application to the following:
 - 1. Do not apply finish coats until paintable sealant is applied.
 - 2. Back prime wood trim before installation of trim.

1.10 WARRANTY

- A. Section 01700 - Execution Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for paints and coatings.

1.11 EXTRA MATERIALS

- A. Section 01700 - Execution Requirements: Spare parts and maintenance products.
- B. Supply 1 gallons of each color, type, and surface texture; store where directed.
- C. Label each container with color, type, texture, room locations, and in addition to manufacturer's label.

2PART PRODUCTS

2.1 PAINTS AND COATINGS

- A. Manufacturers: Paint Transparent Finishes Stain Primer Sealers Block Filler Field Catalyzed Coatings.
 - 1. Benjamin Moore & Co.
 - 2. ICI
 - 3. Sherwin Williams
 - 4. Coronado
 - 5. Devoe
- B. Manufacturers: Paint System over Concrete (Columns, Beams, etc).
 - 1. Tnemec
 - 2. Substitutions : As provided by Instrucitons to Bidders and/or Section 01600.

2.2 COMPONENTS

- A. Coatings: Ready mixed, except field catalyzed coatings. Prepare coatings:
 - 1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
 - 2. For good flow and brushing properties.
 - 3. Capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve finishes specified; commercial quality.
- C. Patching Materials: Latex filler.
- D. Fastener Head Cover Materials: Latex filler.

3PART EXECUTION

3.1 EXAMINATION

- A. Section 01300 - Administrative Requirements: Coordination and project conditions.
- B. Verify surfaces substrate conditions are ready to receive Work as instructed by product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

- D. Test shop applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors: 8 percent.

3.2 PREPARATION

- A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects.
- C. Marks: Seal with shellac those which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply latex based compatible sealer or primer.
- G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
- J. Copper Surfaces Scheduled for Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.
- K. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- L. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

- N. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- O. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand power tool wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
- Q. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- R. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
- S. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior paintable caulking compound after prime coat has been applied.
- T. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.
- U. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
- V. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear sealer. tinted primer.
- W. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- B. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.
- C. Sand wood and metal surfaces lightly between coats to achieve required finish.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.
- F. Prime concealed surfaces of interior and exterior woodwork with primer paint.
- G. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

- H. Finishing Mechanical And Electrical Equipment:
1. Refer to Divisions 15000 and 16000 for schedule of color coding and identification banding of equipment, duct work, piping, and conduit – *required for exposed ductwork, piping and conduit only per value engineering revisions.*
 2. Paint shop primed equipment. Paint shop finished items occurring at interior areas.
 3. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 4. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, and except where items are shop finished.
 5. Paint interior surfaces of air ducts and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
 6. Paint exposed conduit and electrical equipment occurring in finished areas.
 7. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
 8. Color code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated. color schedule. Color band and identify with flow arrows, names, and numbering.
 9. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Requirements 01700 - Execution Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect and test questionable coated areas in accordance with.

3.5 CLEANING

- A. Section 01700 - Execution Requirements: Final cleaning.
- B. Collect waste material which may constitute fire hazard, place in closed metal containers, and remove daily from site.

3.6 SCHEDULE - SHOP PRIMED ITEMS FOR SITE FINISHING

- A. Metal Fabrications (Section 05500): Exposed surfaces of stair framing, lintels, bollards, etc.
- B. Metal Stairs (Section 05510): Exposed surfaces of stringers, exposed vertical risers.

3.7 SCHEDULE - EXTERIOR SURFACES

- A. Pavement Markings:
1. Two coats of traffic paint, yellow or white as selected by Architect.
- B. Steel - Unprimed:
1. One coat of alkyd primer.
 2. Two coats of alkyd enamel, gloss.
 3. For railings and bollards use high performance coating system:
 - a. *Epoxy Primer apply at 4 to 6 mil thickness - Carboline 893 2-component Cross linked epoxy or Tnemec Series 27F.*
 - b. *Typoxy Polyamid Epoxy: 2 Top Coats Aliphatic polyurethane enamel applied at minimum of 2 mils DFT(dry film thickness) per coat - Carboline 133 HB Aliphatic Polyurethane or Tnemec Series 1075 Endura-Shield 3-5.*

- C. Steel - Shop Primed:
 - 1. Touch-up with zinc chromate primer.
 - 2. Two coats of alkyd enamel, gloss.
- D. Steel - Galvanized:
 - 1. One coat galvanize primer.
 - 2. Two coats of alkyd enamel, gloss.

3.8 SCHEDULE - INTERIOR SURFACES

- A. Wood - Painted:
 - 1. One coat of latex prime-sealer.
 - 2. Two coats of alkyd enamel, semi-gloss.
- B. Wood - Transparent:
 - 1. Filler coat (for open grained wood only).
 - 2. Two coats of stain.
 - 3. One coat sealer.
 - 4. Two coats of varnish satin.
- C. Cabinet Interior:
 - 1. One coat of latex prime sealer.
 - 2. One coat of alkyd enamel, semi-gloss.
- D. Steel - Unprimed:
 - 1. One coat of alkyd primer.
 - 2. Two coats of alkyd enamel, semi-gloss.
- E. Steel - Primed:
 - 1. Touch-up with alkyd primer.
 - 2. Two coats of alkyd enamel, semi-gloss.
- F. Steel - Galvanized:
 - 1. One coat galvanize primer.
 - 2. Two coats of alkyd semi-gloss.
- G. Concrete Floors:
 - 1. Verify compatibility with waterproofing installed with concrete. If required acid etch surface to receive epoxy coating.
 - 2. Two coats waterborne epoxy (BM Super Spec HP).
- H. Gypsum Board: All surfaces unless noted otherwise.
 - 1. One coat of latex primer sealer.
 - 2. Two coats of latex eggshell.
- I. Gypsum Board in all **wet areas** including Toilet Rooms, Housekeeping Rooms, Janitors Closets, Kitchens, Lounges, and Locker Rooms: (3 coats with total dry film thickness not less than 2.5 mils.)
 - 1. One coat of latex primer sealer.
 - 2. Two coats of odorless alkyd enamel, semi-gloss.
- J. Wall Surfaces Under Vinyl Wall Covering:
 - 1. One coat of alkyd primer sealer.

END OF SECTION

SECTION 10210
METAL WALL LOUVERS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Louvers and frames with bird and insect screening and any blank out sheeting required for the application.
- B. Refer to Drawings.
- C.

1.02 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate on shop drawings, layout, elevations, dimensions, and tolerances; head, jamb, and sill details; blade configuration; screening; and frames.
- C. Provide product data on preassembled louvers describing design characteristics, maximum recommended air velocity, free area, materials, and finishes.
- D. Submit samples under provisions of Section 01300.
- E. Submit two samples 2 x 4 inch in size illustrating finish and color of exterior and interior
- F. Submit manufacturer's installation instructions under provisions of Section 01300.

1.03 COORDINATION

- A. Coordinate work of this Section with installation of masonry flashings.
- B. Coordinate work of this Section with mechanical ductwork.

PART 2 - PRODUCTS

2.01 ACCEPTABLE Manufacturers

- A. Airolite, Type CB609 weatherproof, storm resistant extruded aluminum louvers (4" depth) with drainable blades
- B. Equal products by Construction Specialties, Ruskin are approved for bidding.
- C. Substitutions: Section 01600 - Material and Equipment and Instructions to Bidders.

2.02 MATERIALS

- A. Aluminum: Aluminum alloy 6063-T52 extruded shape. Louvers shall be finished after assembly baked enamel finish meeting AAMA2603.

2.03 ACCESSORIES

- A. Bird Screen: Interwoven wire mesh of aluminum, 0.063 inch diameter wire, 1/2 inch open

weave, square design.

B. Insect Screen: aluminum mesh, set in aluminum frame.

C. Sealants: Type specified in Section 07900.

2.04 FABRICATION

A. Louver Size: As indicated on drawings.

B. Louver Blade: Drainable Sloped at 49 to 63 Degree; horizontal blades with concealed vertical mullions; minimum material thickness of .081" (2mm). Louvers to be designed to minimize damage from wind driven rain.

C. Louver Frame: Channel shape, welded corner joints, material thickness same as blades.

D. Where metal housing is provided at triangular roof louvers, frame and construct to meet IBC Wind Loading for the area.

2.05 FINISHES

A. Exterior and interior aluminum surfaces, screens: Factory baked enamel color **As selected by Architect.**

B. Interior Aluminum Surfaces, Screens, and Blank Out Sheeting: clear aluminum.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Secure louvers in opening framing with concealed fasteners.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Install bird and insect screening to exterior and interior of louver.

F. Install insect screens to intake louvers. Install bird screens to exhaust louvers.

G. Install perimeter sealant and backing rod in accordance with Section 07900.

END OF SECTION

SECTION 10350
FLAGPOLES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide flagpoles where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experience in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Shop Drawings showing general layout, dimensions, base design and its connection to foundation, anchoring and support system, and grounding system.
 - 4. Design, calculations, drawings, and other data needed to secure approval of foundation from governmental agencies having jurisdiction.
 - 5. Manufacturers' recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

PART 2 - PRODUCTS

2.01 FLAGPOLE MANUFACTURERS

- A. For the purpose of establishing quality, type and design, products manufactured by Colonial Flag, Model # IWM60F23-AA, have been specified. ColonialFlag.com phone: 800-782-0500.
- B. Equal products by the following are approved for bidding:
 - 1. American Flagpole Division of Kearney-National, Inc.
 - 2. Acme Flagpoles Company Division of Lingo, Inc.
- C. Substitutions: Per Instructions to Bidders and Section 01600.

2.01 FLAGPOLES

- A. Provide flagpoles, accessories, bases, and anchorage devices as complete units furnished by one manufacturer, and with the following attributes:

1. Overall dimensions:
 - a. 60 feet high exposed, with 12 inch butt and 4 inch top diameter, wall thickness of .250 inch.
 2. Design:
 - a. Uniform, straight line, cone tapered sections above cylindrical butt sections, manufactured from seamless aluminum tube of 6063-T6 alloy, heat treated and age hardened.
 - b. Taper 52 feet 4 inches.
 - c. Provide internal splicing, self-aligning sleeve of same material as flagpole for snug fitting, precision field joints.
 3. Finish:
 - a. Below ground: Shop coat of asphaltic paint inside and outside.
 - b. Exposed aluminum surfaces: Directional satin ground, 50 grit.
- B. Fittings and accessories:
1. Provide flash collar of spun aluminum.
 2. Provide finial gold anodized ball 14 gage spun aluminum on each flagpole.
 3. Operation: Manually operated internal winch with removeable handle and flush access door with compression lock.
 4. See attached detail at end of Section.
- C. Provide ground set foundation assembly and lightning protection system as standard with the approved manufacturer and as approved by governmental agencies having jurisdiction.

2.02 FOUNDATIONS

- A. Provide the services of an engineer licensed in the State of Louisiana to perform such work at the location of the Work, and design a foundation for each flagpole to comply with pertinent requirements of governmental agencies having jurisdiction.
- B. Provide such drawings and calculations as are required, and make necessary arrangements and pay such costs as are involved, and secure approvals of governmental agencies having jurisdiction.
- C. Provide labor and materials and perform such services as are needed and construct the foundations in the locations shown on the Drawings and as approved by the Architect and the governmental agencies having jurisdiction.

2.03 FLAGS

- A. Furnish and install one 15 ft. x 25 ft. Heavy Duty 100% 2-ply , spun woven Polyester American Flag.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install the flagpoles and accessories in strict accordance with the manufacturers' recommendations as approved by the Architect, aligning plumb to a vertical tolerance of one in 1000, and adjusting operating components for optimum smoothness of operation.

END OF SECTION

Internal Winch - Ground Set

Model # IWM60F23-AA

Customer Name:

Rep Name:

Architect Name:

Project:

Location:

PO Number:

Quantity:

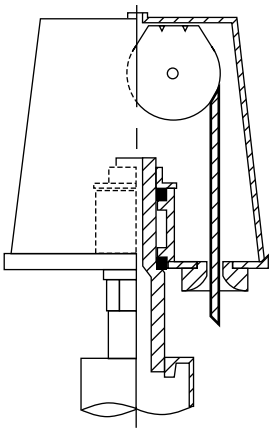
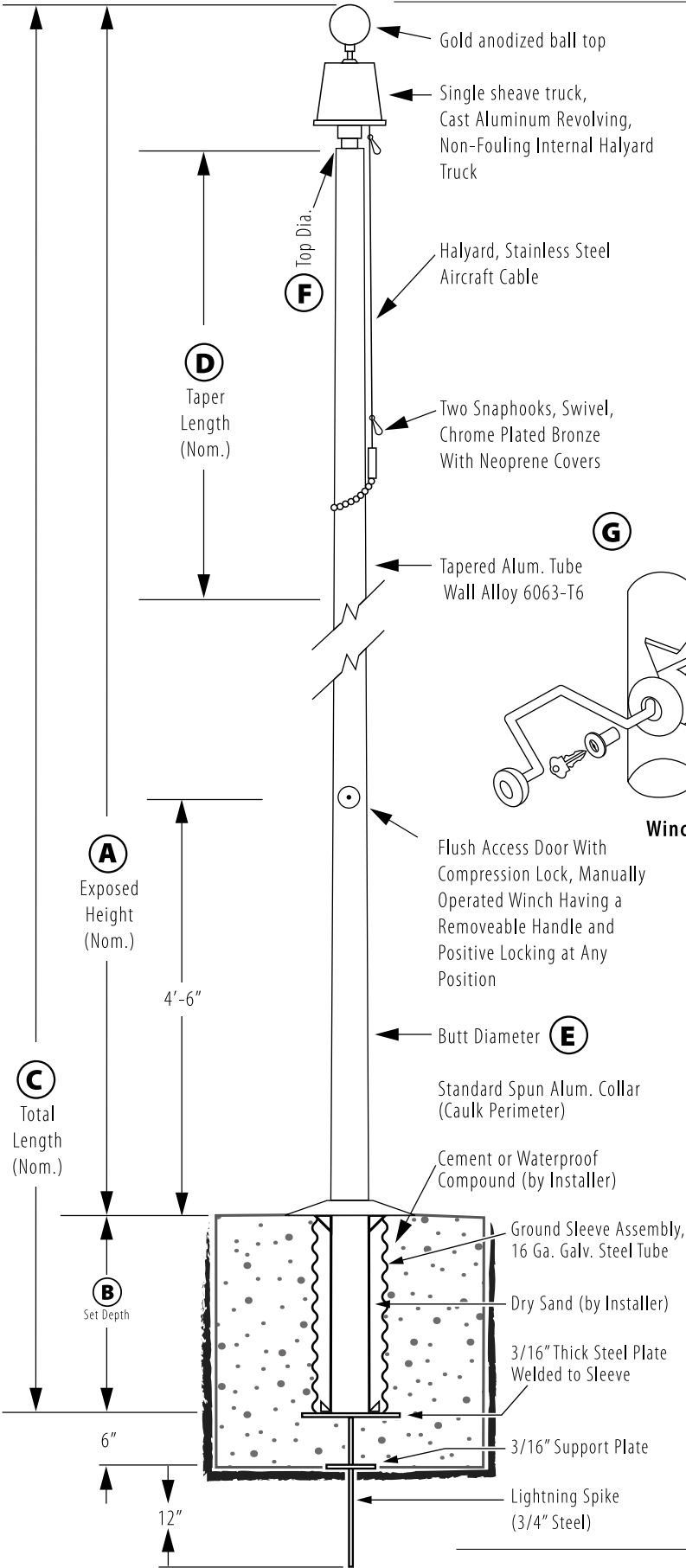
Notes:

A - Exposed Height	60 ft.
B - Set Depth	6 ft.
C - Total Length	66 ft.
D - Taper	52 ft. 4 in.
E - Butt Diameter	12 in.
F - Top Diameter	4 in.
G - Wall Thickness	0.250 in.

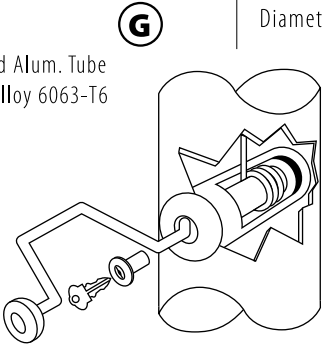
Finish:
Anodized, Clear

Piece: 3

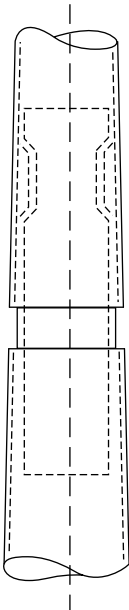
Accessories:
Gold anodized ball top,
standard collar



Revolving Non-Fouling Internal Halyard Truck
Cast Aluminum Body, 26 Stainless Steel Ball Bearings, 2-1/2" Diameter Plate Steel Sheave.



Winch Detail



All shafts with overall length of 33' or more are shipped in **two sections**

1-1/2" maximum shop gap allowed for field fitting (ram for tight joint).

Joint occurs on 2 or more piece flagpoles.

SECTION 10520
FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide fire extinguishers and cabinets where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Provide (one) 10 lb ABC type extinguisher on wall hook at all mechanical and equipment rooms
- C. Provide (one) 5 lb ABC type in each fire extinguisher cabinet unless noted otherwise.
- C. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Dimensioned drawings as needed to depict the space required for these items, and their interface with the work of other trades.
 - 4. Manufacturer's recommended installation procedures which, when approved by the Architect/Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. J. L. Industries
- B. Larsen's Fire Protection and Safety Equipment
- C. Muckle - Manufacturing Division of Technilo, Inc.
- D. Amerex, Corp.
- E. Kidde

- F. Substitutions: Under provisions of Section 01600 and Instructions to Bidders.

2.02 DESCRIPTION

- A. For the purpose of clarity and establishing type and quality items specified by manufacturer's model numbers and names below are based on products manufactured by J. L. Industries.
- B. CABINETS
 - 1. Model - Academy with flat trim - Recessed.
 - 2. Door - Contemporary "V" style.
 - 3. Glazing - Clear double strength
 - 4. Color - Clear Anodized Aluminum.
- C. FIRE EXTINGUISHERS
 - 1. **Cosmic 5E (5 lbs ABC Type)** One in each fire extinguisher cabinet unless noted otherwise.
 - 2. Cosmic 10E (10 lbs ABC Type)
 - 3. Type K (10 lb) Only as indicated on drawings.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect/Engineer, anchoring all components firmly into position for long life under hard use.
- C. Furnish and install wood blocking in partitions as recommended by manufacturer and required for complete installation.

END OF SECTION

SECTION 10800
TOILET ROOM ACCESSORIES

PART 1 - GENERAL

DESCRIPTION

- A. Work included: Provide toilet room accessories where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation. Coordinate the installation of concealed anchor plates with metal studs, RE: Section 09111.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Coordinate installation of concealed anchor plates with metal studs.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.
- B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Manufacturer's data clearly defining the required support and other details of installation to enable proper interface with the work of other trades.
 - 4. Manufacturer's recommended installation procedures which, when approved by the Architect/Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 5. Provide 6" x 6" sample of opaque glass for shower door and one shower door hinge sample after Architect selects finish.

1.04 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 1600.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Described below.
- B. Substitutions: Under provisions of Section 01600 and Instructions to Bidders.

2.02 MATERIALS

- A. Anchors and fasteners:
 - 1. Provide anchors and fasteners capable of developing a retaining force commensurate with the strength of the accessory to be mounted, and well suited for use with the supporting construction.
 - 2. Where exposed fasteners are permitted, provide oval head fasteners with finish matching the accessory.
- B. Provide stainless steel with satin finish on all items of this Section.
- C. Provide all items from a single manufacturer.
- D. Where indicated on the Drawings or specified below provide the following items or equal, as specified above:
 - 1. Mirror: Size 24" x 36: unless indicated otherwise on plans equal to Bobrick #B-290 Series.
 - 2. NOT USED.
 - 3. Toilet Tissue Dispenser - B-4388 Recessed by Bobrick: provide one at each toilet.
 - 4. Robe Hooks: Located at door of **each single toilet room, each dressing room, and each patient toilet room door** shown on Drawings. Bobrick B-7671.
 - 5. Grab Bars with concealed mounting as shown on drawings, Bobrick #B-550.99, Bradley Model 8932. Concealed steel anchor plates shall be provided for grab bar equal to 256 Series Anchor Plates as manufactured by Bobrick.
 - 6. Paper Towel Dispenser-Toilet Rooms: Bobrick B-359033 TrimLineSeries-Recessed. Provide one at each toilet room handwash sink.
 - 7. Paper Towel Dispenser-: Bobrick B-4262 ConturaSeries- Surface mounted. Provide one at each at all handwash sinks other than toilet rooms.
 - 8. Soap Dispensers: Ecolab, Bacti-foam 750ml model #EL61806499, plastic container with pumping device: one per lavatory or sink.

2.03 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install each item in its proper location, firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 13120
PRE-ENGINEERED METAL BUILDING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED -

- A. Work of this section covers the design, fabrication and erection of a modular, rigid frame type, pre-engineered metal building of dimensions, slope and heights indicated on drawings.
- B. Building components specified herein include structural framing, roof panels, framed openings, *cantilever supports and framing*, flashings, gutters and downspouts (refer to drawings), bracing, fasteners, and accessories as indicated or specified including any framing pieces to accommodate installation of doors, fans, etc. shown on the drawings for a complete engineered building system.
 - 1. Contractor shall review all documents and accommodate loading of such items as fans and hood exhaust, louvers, overhead doors, etc.
 - 2. Provide overhangs as shown on the drawings: standard and extended overhangs.
 - 3. Structural deviations from that shown on the drawings, i.e. endwall framing, must be coordinated with architectural elements shown and shall be approved by the architect.

1.2 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The latest edition of each reference shall apply unless otherwise specified.
 - 1. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
AISC S326 (1989) Voluntary Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings. (Allowable Stress Design)
 - 2. AMERICAN IRON AND STEEL INSTITUTE (AISI)
AISI - 01 (1999) Cold-Formed Steel Design Manual
 - 3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
ASTM A36/A572/A992 Structural Steel
ASTM A65 Steel Sheet, Zinc-Coated (G-90 Galvanized) by Hot-Dip Process, Structural (Physical) Quality.
ASTM A475 Extra High Strength Grade Cable
ASTM A529 High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A1011 SS/HSLAS, /ASTM A607, Gr. 55 Steel, Sheet and Strip
ASTM A792 SS Steel Sheet, Aluminum-Zinc Alloy Coated by Hot-Dip Process
ASTM A53 / A500, Gr. B Hollow Structural Shapes
ASTM A307 Common Bolts
ASTM A325 / A490 High Strength Bolts
ASTM B117 Salt Spray (Fog) Testing
ASTM D523 Specular Gloss
ASTM D4214 Evaporating Degree of Chalking of Exterior Paints
ASTM D968 Abrasion resistance of Organic Coatings by Falling Abrasive
ASTM D2244 Calculation of Color Differences from Instrumentally Measured Color Coordinates

- 4. ASTM D2247 Testing Water Resistance of Coatings in 100% Relative Humidity
- 5. AMERICAN WELDING SOCIETY (AWS)
AWS D1.1 (2000) Structural Welding Code-Steel
- 6. FEDERAL SPECIFICATIONS (FS)
FS TT-P-664 Protective Coatings for Fabricated Structural Members
- 7. METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
MBMA-01 (2002) Low Rise Building Systems Manual
- 8. UNDERWRITERS LABORATORIES, INC (UL)
UL 580 Test for Uplift Resistance of Roof Assemblies

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: United States owned company regularly engaged in the fabrication of metal building systems for a minimum of 10 consecutive years and a member of the Metal Building Manufacturer's Association.
 - 1. Certified by American Institute of Steel Construction (AISC) Metal Building Certification Program (Category - MB).
- B. As a basis of quality, these specifications herein delineate the material quality, design criteria and workmanship used in building systems designed, manufactured and furnished by United Structures of America, Inc., Red Dot Buildings or Metallic Building Company. Like products of other manufacturers may be approved providing they meet all the requirements specified herein. Approval of such is subject to requirements as set forth in the general section of these specifications.
- C. All structural mill sections and welded up plate sections shall be designed in accordance with the AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", and all cold-formed steel structural members shall be designed in accordance with AISI "Specifications for the Design of Cold-Formed Steel Structural Members".
- D. All roof panels shall be designed in accordance with the AISI "Specifications for the Design of Light Gauge Cold-Formed Steel Structural Members".
- E. All welding shall be in accordance with the AWS "Structural Welding Code", D1.1.
- F. Building loading application and design shall be in accordance with the specified Building Code, or if none is specified, the Metal Building Manufacturers Association's "Recommended Design Practices Manual"

1.4 SUBMITTALS

- A. Certifications: Provide a letter of design certification for the structural framing system, signed and sealed by a qualified professional engineer registered in the **State of Louisiana** where the jobsite is located. The certification letter shall indicate this location has been accommodated with loading per **International Building Code 2021**, AISC – Category MB certification shall be indicated for the Design facility and the Manufacturing facility.
- B. Design Drawings: Submit anchor bolt layouts, framing plans, elevations and necessary sections and details.
 - 1. Provide erection drawings bearing the seal of a Louisiana Professional Engineer.

2. Provide layouts of roofing panels, edge conditions, panel joints, corners, trims and flashings.
3. Foundation Reactions: Provide for foundation reactions and size anchor bolts as well as the required anchor bolt embedment length and details to resist anchor bolt pull-out and bearing stresses acting on the anchor bolts and base plates per **International Building Code 2021**

1.5 DESIGN LOADING CRITERIA

- A. Design shall meet or exceed **IBC 2021** for this location. Dead Loads shall consist of weight of metal building and components of finished building documented in attached drawings, mechanical equipment, lighting, etc suspended from the structure.
- B. DEFLECTION CRITERIA
 1. Primary Framing: L/200 to coordinate with masonry
 2. Frame side sway: Range from H/400 with the design wind load.
 3. Secondary Roof Framing: L/150
 4. Secondary Wall Framing: L/90

1.6 WARRANTIES

- A. Provide building manufacturer's warranty guaranteeing the building system against defects in material for one year from the date of acceptance and shall provide for replacement of warranted material as required within that time period.
- B. Roof Panel Integrity: Provide manufacturer's standard twenty year warranty against perforation of metal panels due to corrosion under normal weather and atmospheric conditions.
- C. Roof Panel Finish: Provide manufacturer's standard twenty year warranty against cracking, peeling and color fade. The following are the color fade and chalking limitations:
 1. Color Retention: No color change in excess of an average of 5 NBS Units when measured in accordance with the procedure set forth in ASTM D2244.
 2. Chalking: Minimum of 8 rating when tested in accordance with ASTM D659.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. The building shall be a sloped roof building of steel frames, purlins and columns, with building width, length and bay spacing, eave height and roof slope as indicated on the drawings.

2.2 PRIMARY FRAMING

- A. The pre-engineered structure system varies:
Rigid frames with **straight columns**, purlins, etc. End wall may be end wall frame coordinated with Architectural layout. Refer to the drawings. Bracing shall accommodate Architectural features shown in drawings.
- B. The materials used in the fabrication of the primary framing shall be designed utilizing standard practices, generally in compliance with the AISC code.

1. Structural flat plate, strip and/or bar stock generally shall conform to the physical requirements of ASTM A1011, ASTM A572, ASTM A529, A607, or ASTM A36 as applicable, and shall have a minimum yield strength of 55,000 psi.
2. W, M, and S shapes shall be of material conforming to the physical requirements of ASTM A36/A572/A992 and shall have a minimum yield strength of 36,000 psi.
3. Round pipe or tube sections shall be of material conforming to the physical requirements of ASTM A53 grade B and shall have a minimum yield strength of 35,000 psi.
4. Members fabricated from plate or bar stock materials shall have flanges and webs joined on one side of the web by a submerged arc continuous weld process.

2.3 SECONDARY FRAMING

- A. Secondary framing shall be the structural members which distribute the loads to the primary framing systems, and shall include the eave struts, purlins, girts, wind bracing and other miscellaneous structural members. They shall be manufactured of cold-form light gage sections, welded plate sections and/or structural shapes.
 1. Eave struts shall be nominal 8", 10" or 12" deep "cee" shaped members, and shall be designed as simple span for the specified loads.
 2. Purlins and girts shall be nominal 8", 10", or 12" deep "zee" or "cee" shaped members, and shall be designed as simple span, partially continuous or continuous for the specified loads.
 3. Wind and seismic longitudinal bracing shall consist of a system of diagonal (cable or structural shapes) bracing, portal frames, cantilevered / fixed base columns or diaphragm bracing.
 4. Miscellaneous members shall normally be those members such as base angles, flange braces, jambs, headers, etc. These members shall be engineered for the specific purpose they serve within the over-all Metal Building System.
 5. Provide Secondary Members needed for mounting of doors, **including overhead doors** that must anchor to steel and mechanical equipment and as shown on drawings for infill wall supports and openings.
- B. Materials used in the fabrication of secondary framing shall be designed utilizing standard practices, generally in compliance with the applicable sections of AISC and AISI.
 1. Cold form members shall be fabricated of material conforming to the physical requirements of ASTM A1011 or A607 and shall have a minimum yield strength of 55,000 psi.
 2. Cable bracing shall be coordinated with architectural elements shown and shall be fabricated of material conforming to the physical requirements of ASTM A475-78 for extra strength grade. If cable bracing cannot be coordinated, this contractor will provide for alternate means of bracing at no additional cost.

2.5 STRUCTURAL PRIMER

- A. After fabrication, all components fabricated from welded plate sections, structural shapes or round pipe shall be prepared equal to the standards of SSPC-SP2 and primed with one shop coat of red primer which meets or exceeds the end performance of Federal Specification TTP-664. Primer shall be applied to a dry film thickness of 1 mil.
- B. Material used for components fabricated by cold form process shall be precoated by a commercial coater using a preparation process equal to SSPC-SP10 and after oven heating, apply a red oxide primer which meets or exceeds the end performance of TTP-664. Primer shall be applied to a dry film thickness of .5 mil.

2.6 ROOF COVERING

- A. Roof covering shall consist of the roof panels, their attachments, trim and sealants for use on the exterior of the roof and shall be equal to the following:
 - 1. Panel Rib Roofing panels shall have uplift resistance to 90 mph wind certified by Factory Mutual with Kynar 500 finish to be selected.
 - 2. Roof covering shall provide a 36" net coverage with ribs **to match existing**. Panel laps shall be at major ribs. Anchor with gasketed self-drilling color matched fasteners and weatherproof with sealants at every metal-to-metal contact point. Panels shall be continuous from ridge to eave until panel exceeds 40' and/or panel becomes prohibitive to handle (must be shown on shop drawings).
- B. Material used in the fabrication of roof panels shall be a minimum of 24 gage having a minimum yield strength of 50,000 psi. Exterior finish for roofing shall be Galvalume or precision coated, commercial grade Fluoropolymer-series 500 coating with color to be selected by the owner from the manufacturers standard colors.

2.8 METAL SOFFIT PANELS, GUTTER, EAVE TRIM, ETC.

- A. Metal soffits are not required on this project. (Only as indicated on Drawings)
- B. Gutters and downspouts shall match building materials and shall meet construction standards of Sheet Metal Manufacturers' Associations standards.

2.9 ACCESSORIES

- A. ROOF FLASHING UNITS shall nominally be used for roof mounted mechanical equipment and/or vents. Flashings units are not intended to support any type of load. Loads are supported by means of subframes and/or auxiliary secondary support systems. Flashing base configuration shall match the panel profile of the roof on which it is used.
- B. ROOF CURB UNITS are available in peak or hillside applications. Curbs are at least 18 gage galvanized material with welded construction and are insulated. Provide roof curb units with a baked-on powder coated finish to match the roof panel finish.
- C. ROOF JACKS shall be for flashing of plumbing vent stacks and/or other pipe-like penetrations. Jacks shall be black with flat, malleable bases that can be field formed to fit any standard panel configuration. Jacks shall have a heat range of -65 degrees centigrade to +250 degrees centigrade.
- D. FRAMED OPENINGS IN WALLS shall normally be an opening framed with 16 gage minimum, cold-formed members designed to meet the specified loads. Openings shall be trimmed in accordance with USA's standard practices unless shown otherwise on drawings.
- E. LOUVERS shall be shop fabricated out of 18 gage galvanized steel, self-framing and self-mulling, welded frames with 20 gage galvanized blades. Louvers shall have weathertight (refer to section 10210). Louvers are to be provided with a color finish to match metal wall panels. Louvers shall be size and location shown on the drawings. A removable insect screen and bird screen shall be provided with each louver

- F. *INSULATION will be furnished by others -see section 07219.*

PART 3 - EXECUTION

3.1 PREPARATION

- A. Erection of the pre-engineered building shall be performed by a company regularly engaged in the erection of metal buildings for a minimum of 5 years.
- B. Work shall be coordinated with work of other trades so that construction work of all trades can be properly completed.
- C. Before proceeding with the erection and in time to permit correction of defective setting, the owner shall verify the location and elevation of all anchor bolts for column bases.
- D. Erection practices shall conform to the MBMA "Code of Standard Practices" Section 5

3.2 ERECTION

- A. Erect building in accordance with the building manufacturer's erection drawings and written instructions.
- B. Field modifications shall not be made to structural members except as authorized by the building manufacturer.
- C. Erect building and all components plumb, true and level to lines and profiles indicated.
- D. Framing: Level base plates to a true even plane with full bearing to supporting structures.
- E. Purlins and Girts: Locate and space girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to straight line with temporary shoring until secured by exterior sheeting.
- F. Bracing: Provide diagonal cable bracing (or other bracing as required by design) in roof and sidewalls as indicated on the erection drawings.
- G. Roofing: Arrange and nest side-lap joints so prevailing winds blow over lapped joints. Apply panel and associated items for neat and weather tight enclosure. Avoid panel creep or applications not true to line. Protect factory finishes from damages.
 - 1. Field cutting of panels by torch is not permitted.
 - 2. Install weather seals as per manufacturer's instruction.
- H. Sheet Metal Accessories: Install gutters, downspouts, curbs, trim and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight anchorage.

3.3 CLEAN-UP AND PAINTING

- 3.3.1 Clean building and components free of dirt, dust, grease and oil.

3.3.2 Prepare surfaces and touch up structural steel, purlins, girts and other framing members with coating system of same type and color as used in shop coat.

3.3.3 Clean exposed surfaces of the building promptly after erection is completed. Clean pre-finished work per coating manufacturer's directions.

END OF SECTION

DIVISION 13 - ELECTRICAL SAFETY AND SECURITY
SECTION 13850 - FIRE DETECTION AND ALARM

PART 1.00 GENERAL

1.01 INCLUDED IN THIS SPECIFICATION

- A. Provide a complete fire alarm system per this project's plans and specifications. The system shall include a state-of-the-art, software-based control panel using addressable and analog type initiating.
- B. These specifications and the accompanying Drawings define the intent of the fire alarm system to be provided. In addition to the system as specified herein and shown on the Drawings, the Contractor shall provide all planning, design, calculations, equipment, devices, raceways, boxes, cabling, system programming and any other component or service required for a complete, fully operational and code compliant system.

1.02 REFERENCES

- A. Electrical Industries Association (EIA):
 - 1. RS-232-D – Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
 - 2. RS-485 – Electrical Characteristics of Generators and Receivers for Use in Balanced Multipoint Systems
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems.
 - 2. NFPA 13 – Installation of Sprinkler Systems.
 - 3. NFPA 15 – Standard for Water Spray Fixed Systems for Fire Protection.
 - 4. NFPA 16 – Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.
 - 5. NFPA 16A – Standard for the Installation of Closed Head Foam-Water Sprinkler Systems.
 - 6. NFPA 70 – National Electrical Code (NEC).
 - 7. NFPA 72 – National Fire Alarm Code 2010 Edition
 - 8. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 9. NFPA 101 – Life Safety Code 2012 Edition
 - 10. NFPA 750 – Standard on Water Mist Fire Protection Systems.
 - 11. NFPA 5000 – Building Construction and Safety Code.
 - 12. IBC Chapters 9 & 10 2012 Edition
 - 13. ADAAG Americans with Disabilities Act Application Guidelines
- C. Fire Alarm Control Panel Equipment: System shall comply with applicable provisions of the following UL standards and classifications:
 - 1. UL 864 9th Edition
 - 2. UOJZ, Control Units, System.
 - 3. SYZV Control Units, Releasing Device.
 - 4. UOXX, Control Unit Accessories, System.

- D. The Fire Alarm Control Panel's U.L. Listed signaling types shall be:
1. Digital alarm communicator
 2. Other Technology

1.03 SUBMITTALS

- A. Equipment Submittal Brochures:
1. Provide minimum 10 copies of submittal brochures and shop drawings.
 2. Submittal brochures shall be bound by means of 3 ring binders, binding combs or similar. Stapled brochures will be rejected.
 3. Provide one submittal brochure in color, highlighted and reserved for use by the Louisiana State Fire Marshal Plan Review Office. This copy shall become the record copy for the project.
 4. Include a cover page that indicates the following minimal information:
 - a. Project name and address.
 - b. Engineered systems distributor's name and contact information.
 - c. Installing contractor's name and contact information.
 - d. The date of the equipment submittals and date of any subsequent required re-submittals. Indicate on revised submittals the original submittal date and re-submittal date.
 - e. Architectural project review number assigned by the Louisiana State Fire Marshal's Office.
 5. Provide a Scope of Work Narrative describing the system's basic operating premise in written word.
 6. Provide a detailed Sequence of Operation Matrix Grid tailored for this project indicating the cause and effect of all fire alarm system control panels, input and output functions.
 7. Include a system bill of material prepared specifically for this project. Include the make, model, description, quantity and manufacturer for every component to be installed in the project.
 8. Provide manufacturer's data sheet for each component to be installed in the project. For data sheets that include multiple part numbers, options and accessories, the components included or pertinent to this project shall be highlighted in yellow.
 9. Include the U.L. (Underwriters Laboratories) Certification for each component to be installed in the system. The U.L. Certification shall be placed directly behind its corresponding data sheet.
 10. Manufacturers device compatibility documentation shall be included proving testing and operational compatibility between control panels and peripheral devices.
 11. Separate battery calculations shall be provided for each control panel and prepared on manufacturer's official worksheets.
- B. Shop Drawings
1. Shop drawings shall be prepared with the contractor's own title block which shall include:
 - a. Project name and address.
 - b. Contractor's name, address and phone number.

- c. Date.
 - d. Drawing pages shall be numbered.
 - e. Bound with spines and stapled.
 - f. Floor plan scale.
 - g. Louisiana State Fire Marshal architectural assigned project number.
 - h. Revision number with re-submittal dates.
2. Drawings shall contain one floor per page. If a floor must be split use match lines and references that refer sheet number to match lines.
 3. Floor plan shop drawings shall be prepared in AutoCAD.
 4. Prepare floor plans to a 1/8" = 1'-0" scale unless directed otherwise by the architect.
 5. Show all equipment, control panels, and device locations.
 6. Include a distinct address for every device including panels, initiating, notification, auxiliary, and peripheral devices. All visual notification appliances shall have their candela indicated.
 7. Floor plans shall include the following:
 - a. Door swings.
 - b. Room names and numbers.
 - c. Reflected ceiling plan overlay.
 - d. Ceiling heights.
 - e. Fire and smoke barriers.
 - f. Office furnishings when available.
 8. Include a symbol schedule of devices for this project.
 9. Include the necessary details and general notes for mounting heights, device placement restrictions, etc.
 10. End-of-line symbols shall be shown on the floor plans.
 11. Riser locations shall be indicated on the floor plan by a bold circle.
 12. A detailed riser shall be provided as part of the shop drawings. The riser shall include:
 - a. Control panels, power supplies, annunciators, demark cabinets, each identified with its own address and description matching the symbol schedule.
 - b. Operating power requirements with breaker panel and breaker number identification.
 - c. All system circuits including initiating, notification, SLC, power, control, monitor, network, audio, riser, fiber optic, phone, category cable and auxiliary circuits. Circuits shall be individually addressed indicating wire type, size, quantity and color.
 - d. Provide a point to point diagram of every system device on its riser circuit using the exact device symbol as the floor plan. Provide the corresponding device address and candela rating next to each device.
 - e. Provide the cumulative current draw at the end of each notification appliance circuit.
 - f. Indicate location and placement of surge suppressors.
 - g. Provide detail circuit diagrams for connections with systems from other trades.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, number and manufacturer.
- B. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Protect materials from damage during handling and installation.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Personnel shall be trained and certified by manufacturer for installation of units required for this Project and shall be supervised by a Nicet Level III Supervisor.
 - 2. Manufacturer's product shall have been in satisfactory operation on three installations of similar size, type and design as this project, for approximately 3 years.
 - 3. The installing contractor shall have been actively engaged in the business of designing, selling, installing, and servicing fire alarm systems for at least ten (10) years.
 - 4. The installing contractor shall provide 24-hour, 365 days per year emergency service with factory trained, state licensed service technicians.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Source Limitations: Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer.

1.06 MAINTENANCE AGREEMENT

- A. Contractor shall warranty material and installation against defects in manufacturing and workmanship for a period of one year beginning on the date of final acceptance of the project. Warranty related service calls shall be provided at no charge during the contractor's normal working hours.
- B. Initial Maintenance Service: Beginning at Substantial Completion, provide full inspection and maintenance by skilled employees of manufacturer's designated service organization during the Warranty period, including any special warranty period specified.
 - 1. Include inspection, maintenance, testing, and repair contract in compliance with the manufacturer's recommended routine preventive maintenance program and NFPA 72 requirements necessary to maintain full ongoing listing on the complete installed system.
 - 2. Provide parts and supplies same as those used in the manufacture and installation of the original equipment.
 - 3. The contractor performing the contract services shall be qualified and listed to maintain ongoing certification and listing of the completed system.
- C. Extended Maintenance Service: Offer for the Owner's consideration and evaluation at the time of Product Data Submittal, a priced inspection, maintenance, testing, and repair

contract in compliance with the manufacturer's recommended routine preventive maintenance program and NFPA 72 requirements necessary to maintain full ongoing listing on the complete installed system.

1. The services offered under this contract shall begin after the completion of the Initial Maintenance Service and Warranty Period.
2. The Owner shall have the option of renewing for single or multiple years, up to five years, at the price quoted upon completion of the Warranty period.
3. The contractor performing the contract services shall be qualified and listed to maintain ongoing certification and listing of the completed system.

1.07 COORDINATION

- A. Coordinate installation and operational requirements for automatic elevator recall, including but not limited to the recall signal time frame, with Division 14 and with authorities having jurisdiction.
- B. Coordinate installation and operational requirements for fire-protection systems, including but not limited to water-based sprinkler system, pre-action system and clean agent extinguishing system, with Division 21.
- C. Coordinate installation and operational requirements for smoke control systems with Division 23.
- D. Coordinate installation and operational requirements for kitchen fire-suppression systems with hood manufacturer, fire-suppression system manufacturer and with Division 23.

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

- A. The following are acceptable manufacturers and series for control panels.
 1. Gamewell S3 Series
 2. Edwards I0 Series
- B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality.
- C. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than listed above provide proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.02 FIRE ALARM SYSTEM OPERATIONAL DESCRIPTION

- A. The fire alarm system shall be fully addressable with notification and initiation devices as shown on drawings. Additional components shall be provided as required for a complete, functional, and code compliant system.
- B. Alarm Signals:
 - 1. Fire Alarm signal initiation shall be by one or more of the following devices and/or systems:
 - a. Manual Pull Stations
 - b. Heat Detectors
 - c. Smoke Detectors
 - d. Heat detectors in elevator shaft and pit.
 - e. Fire-extinguishing system operation including but not limited to fire suppression for kitchen, dry-pipe sprinkler system and pre-action sprinkler systems.
 - 2. Supervisory signal initiation shall be by one or more of the following devices and/or actions:
 - a. Duct-Mounted smoke detectors.
 - b. Valve supervisory switch. (Operation of a fire-protection system valve tamper switch.)
 - c. Low-air-pressure switch of a dry-pipe sprinkler system.
 - d. Low-air-pressure switch of a pre-action sprinkler system.
 - e. Fire-pump running.
 - f. Fire-pump power failure, including a dead-phase or phase-reversal condition.
 - g. Elevator shunt-trip supervision.
 - 3. System trouble signal initiation shall be by one or more of the following devices and/or actions:
 - a. Open circuits, shorts, and grounds in designated circuits.
 - b. Opening, tampering with, or removing alarm-initiating and supervisory signal initiating devices.
 - c. Loss of primary power at fire-alarm control unit.
 - d. Ground or a single break in fire-alarm control unit internal circuits.
 - e. Abnormal ac voltage at fire-alarm control unit.
 - f. Break in standby battery circuitry.
 - g. Failure of battery charging.
 - h. Abnormal position of any switch at fire-alarm control unit or annunciator.
- C. Specialized Alarm Actions:
 - 1. Elevator Recall: Activate elevator recall system to start in accordance with ANSI Standard A17.1 and NFPA 72. Comply with the following:
 - a. Initiate Elevator Recall Sequence to return elevators to their primary or alternate recall floors upon receipt of a General Alarm by the Fire Alarm Control Panel (FACP).
 - b. Smoke detectors designated for Elevator Recall shall be connected to fire-alarm system. Initiate a General Alarm upon detection of smoke.
 - c. Actuation of the elevator lobby detector located on the designated primary recall floor shall signal the cars to move to the alternate recall floor.

2. Elevator Shunt-Trip Operation: Heat detectors designated for elevator power removal shall be connected to fire-alarm system. Alarm-initiating devices, except those listed, shall not start elevator power removal.
 - a. Actuation of heat detectors in the locations indicated below shall shut down power, via a shunt trip operator, to the elevators associated with the location without time delay:
 - 1) Heat detector in elevator machine room; locate detector within two feet of each sprinkler head.
 - 2) Heat detectors in elevator hoistway; locate detector within two feet of each sprinkler head.
3. Air-Handling System Shut-Down: Upon receipt of a General Alarm by the Fire Alarm Control Unit perform the following, unless otherwise indicated in sequence for smoke control system or sequence for smoke venting system in a windowless anesthetizing locations:
 - a. Operate control relay contacts to signal shutdown of the Air-Handling system(s) serving the evacuation signaling zone where the alarm signal originated. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands. Coordinate and interface with Division 23.
 - b. Shut the smoke or combination fire/smoke dampers at that specific air-handling units' supply and return connections.
 - c. Shut all smoke and combination fire/smoke dampers associated with the air handling system.
 - d. Provide for an adjustable time delay, initially set at 20 seconds, to delay the transmission of close signals to the dampers. The intent of this time delay is to allow the air-handling unit fan(s) to receive the stop signal and slow down before closing any dampers in order to avoid a high static-pressure alarm/trip on the air-handling system.
4. Duct-mounted smoke detector: Duct-mounted smoke detector shall initiate the following functions, unless otherwise indicated in sequence for smoke control system or sequence for smoke venting system in a windowless anesthetizing locations:
 - a. Initiate a Supervisory Alarm.
 - b. Shutdown the associated air-handling unit.
 - c. Shut the smoke or combination fire/smoke dampers associated with that specific smoke detector and shut the smoke or combination fire/smoke dampers at the associated air-handling unit.
 - d. Provide for an adjustable time delay, initially set at 20 seconds, to delay the transmission of close signal to the dampers. The intent of this time delay is to allow the air-handling unit fan(s) to receive the stop signal and slow down before closing any dampers in order to avoid a high static-pressure alarm/trip on the air-handling system.
5. Kitchen Fire-Suppression: An alarm signal from the kitchen fire-suppression system shall initiate the following functions prior to discharge of fire extinguishing agent:
 - a. Initiate General Alarm when the kitchen fire-suppression system is activated.

- b. Operate control relay contacts to remove power from equipment located equipment under kitchen hood. Relay control shall open circuit breaker via use of breaker-mounted shunt trip operator(s).
- c. Operate control relay contacts to close solenoid valve(s) to shut-off fuel supply to kitchen equipment under kitchen hood.
- d. Operate control relay contacts to initiate the smoke evacuation system. Coordinate and interface with Division 23.

2.03 CONTROL PANEL

- A. General Requirements:
 - 1. The system shall have the capability of being activated into alarm, supervisory and trouble modes of operation from both manual and automatic devices.
 - 2. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864
- B. System Cabinet
 - 1. Shall be all metal with a textured finish suitable for surface or semi-flush mounting. Cabinets containing anything non-metal are not acceptable.
 - 2. Front door of steel construction with lockout or dead-front inner door of steel construction to conceal internal circuitry and wiring.
 - 3. Cabinet shall be capable of housing batteries.
 - 4. Cabinet shall be pre-fabricated to accept all available internal circuitry. Installations with loosely hanging internal panel components will not be accepted.
- C. Main Power Supply
 - 1. Shall incorporate the latest power-saving switching technology using no step-down transformers.
 - 2. Shall provide minimum 7 amps of continuous rated output to supply all necessary power under normal and emergency conditions.
 - 3. Shall include an internal battery charger capable of charging up to 55 amp hour batteries while under full load.
 - 4. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the fire alarm control panel. A green "power on" LED shall be displayed continuously while incoming power is present at the building fire alarm control panel.
- D. Batteries
 - 1. Provide U.L. Listed batteries of sufficient capacity to provide power for the entire system automatically upon loss of AC power for a period of 24 hours with 15 minutes of alarm signaling at the end of the 24 hour period.
 - 2. Battery connectors shall be the exact size and type required for the standby battery posts or tabs.
 - 3. Connect batteries to the main panel with minimum 14 AWG stranded hook up wire. Red for positive and black for negative. Use fully insulated crimp style connectors.
- E. Battery Cabinets

1. Provide U.L. listed metal battery cabinet and enclosures with key lockable door for installations requiring batteries too large to be housed in control panels.
2. Battery cabinet shall be textured painted to match the control panel it is housing the batteries for.

F. Display

1. Main control panel shall include a color touch screen display for user interface.
2. Display shall be capable of a minimum 200 characters.
3. The touch screen communications shall be textual RS-485 based with the capability of being mounted locally or remotely.
4. The display shall provide both audible and visual annunciation of all system events.
5. Separate LED's shall be dedicated for:
 - a. AC (normal power): Green
 - b. Fire: Red
 - c. Hazard: Blue
 - d. Supervisory: Yellow
 - e. Trouble: Yellow
 - f. Silenced: Yellow
6. Pre-programmed keys shall be on board for:
 - a. Menu
 - b. Fire Drill
 - c. System Reset
7. Display shall contain a minimum 5 keys that can be custom programmed for system functions
8. The display shall be suitable to be remotely installed as a remote annunciator up to 3,000 feet away from the main CPU cabinet. The remote display shall be available with a manufacturer's custom metal cabinet suitable for surface or semi flush installation complete with a lockable see through door and textured finish matching the main control cabinet.

G. Main System CPU

1. System CPU shall incorporate a 32-bit RISC multiprocessor design on a single circuit board. An isolated watchdog circuit shall monitor the microprocessor and shall activate system trouble on the display upon any failure. The system program shall not be lost upon any loss of power. The CPU software shall support control-by-event (CBE) programming using Boolean logic including AND, OR, NOT, XOR and TIMING functions to provide complete custom programming flexibility. An auto programming option shall be available where only devices that are present on the SLC shall activate.
2. System shall be programmed via the manufacturer's proprietary field configuration program (FCP), allowing the project configuration custom programming to be uploaded and downloaded via a portable laptop computer at the project.
3. An RJ-45 Ethernet port shall be provided to accept downloaded programs from a portable computer, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall operate at 10/100 speeds.
4. An on-board supervised RS-232C Serial Output shall be included to operate remote printers and video terminals.

5. The system CPU shall include an on-board supervised RS-485 Serial Output for connection and communication to system modules. The RS-485 port shall allow for communication with remote annunciator modules up to 3,000' from the cabinet.
6. Smoke detector alarm verification shall be a standard software option while allowing other devices such as manual stations and sprinkler flow to create immediate alarms. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
7. Standard software shall provide for the analog drift compensation of smoke detectors allowing each smoke detector to automatically adjust its sensitivity to accommodate changes caused by the effects of component aging or its surrounding environment including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display smoke detectors that require cleaning and maintenance.
8. System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be a recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor test shall activate system trouble circuitry, display "Test Failed" indication, and identify individual device that failed.
9. The system control panel shall be capable of setting any detector or sensor into Positive Alarm Sequence mode. Positive Alarm Sequence will operate in the following manner. Any alarms received from a device will activate an alarm at the control panel but will not execute any output functions (e.g. turning on the strobes or fire horns). The operator has 30 seconds to "acknowledge" the event or the system will activate a general alarm and sound all the fire horn and strobes. If the operator does acknowledge the vent within thirty (30) seconds, the panel will start a timer for 180 seconds (3 minutes) in which time the operator must find the device in alarm and reset the device. If the operator has not performed a reset within 180 seconds or a second device reports an alarm, the system will immediately sound the general alarm.
10. The CPU display shall have the option of being configured as an additional remote annunciator. This annunciator shall be mounted in its own metal cabinet with lockable door.
11. The CPU shall maintain a 4100 event history log. The log shall be maintained upon loss of any power.
12. 24 volt D.C. power-limited 1 amp outputs shall be provided for both resettable and non-resettable power. The outputs shall be screw terminal on board the CPU board.
13. Manufacturer's standard software shall accommodate a 1 man walk test feature.

H. Signaling Line Circuits

1. Provide 1 SLC loop for this project. Projects including more than 1 floor shall include a second SLC loop. Each SLC shall be capable of being wired Class B Style 4 or Class A Style 6 and shall operate in NFPA Style 7 configuration when equipped with isolator modules.
2. Each SLC shall accommodate a maximum 159 analog sensors and 159 monitor/control devices.

I. Notification Appliance Circuits

1. The CPU shall include a minimum 4 on-board polarized NAC circuits rated at 2 amps DC each. Each NAC shall be capable of being wired Class B, Style Y or Class A, Style Z.
- J. Dry Contacts
1. Form C dry contacts with a 2 amp at 30VDC resistive rating shall be included on-board the CPU for alarm, trouble and supervisory events.
- K. DACT
1. Fire alarm control panel shall include a Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain "Dialer-Runaway" feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. Fire department shall be consulted as to authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges
 2. DACT shall be a U.L. listed internal component of the main control panel and shall be capable of transmitting specific detailed point by point system events to the monitoring station.
 3. Systems using external standalone digital communicators will not be accepted.
- L. Cellular/IP COMMUNICATOR
1. Provide a dual path commercial fire communicator as part of this project.
 2. Acceptable manufacturers:
 3. Fire-Lite Alarms Model IPGSM-4G by Honeywell. All equipment must be available "over the counter" through security equipment distributor network markets and can be installed by dealerships who are independent of the manufacturer. No substitutions allowed.
 4. The central station's supervisory equipment shall be Honeywell's AlarmNet Network Control Center.
 5. Contract the services of a monitoring company sub-contractor or distributor to provide, program the communicator and provide monitoring of the system.
 6. The communicator shall use the internet or GSM cellular network as a primary transmission format.
 7. IPGSM-4G Communicator is connected to any Fire Alarm Control Panel DACT telephone ports, the system shall be capable of transmitting Contact ID formatted alarms, supervisory or troubles to a Honeywell's AlarmNet Network Control Center equipped with a Honeywell AlarmNet receiver via Ethernet over a private or public WAN/LAN, Intranet or Ethernet.
 8. The IPGSM-4G Communicator shall include connections to the Fire Alarm Control Panel's phone outputs and shall convert the contact ID protocol into Ethernet Packets.
 9. The IPGSM-4G Communicator shall be completely field-programmable locally from a 7720P Programming Tool.
 10. The IPGSM-4G Communicator shall be capable of transmitting events in contact ID format.
 11. Communication shall include vital system status such as:

- a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
- b. Independent Addressable Device Status
- c. AC (Mains) Power Loss
- d. Low Battery and Earth Fault
- e. System Off Normal
- f. 24 Hour Test Signal
- g. Abnormal Test Signal (per UL requirements)
- 12. The IPGSM-4G Communicator shall support independent zone reporting via the Contact ID format. This format shall enable the central station to have details concerning the location of the fire for emergency response. The IPGSM-4G Communicator shall be capable of providing simulated phone lines to the Fire Alarm Control Panel. The IPGSM-4G Communicator shall communicate over IP or GSM primary and shall be transparent to the Fire Alarm Control Panel normal operation over phone lines.

2.04 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit.

2.05 PRINTERS

- A. A printer shall not be required for this project.

2.06 SUPPLEMENTARY NOTIFICATION APPLIANCE POWER SUPPLIES

- A. The following are acceptable manufacturers and series for supplementary notification appliance circuit power supplies. No substitutions are allowed. It is the intent of this specification that all notification equipment must be available over the counter through security equipment distributor network markets
 - 1. APS6 of APS10 with the appropriate amp.
- B. The supplementary NAC power supply shall offer up to 6.0 amps continuous regulated 24-volt power. The power supply shall include the following features:
 - 1. Integral Charger: Charge up to 35.0 amp-hour batteries and support 60-hour standby.
 - 2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or supervised addressable relay.
 - 3. Surface-mount back box.
 - 4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.
 - 5. Power limited circuitry in accordance with applicable UL standards.
 - 6. Operates as sync follower or a sync generator.
 - 7. Shall have on-board built in sync capability for System Sensor and Wheelock brand appliances.

- C. Do not exceed 75% of the power supply's available listed current. Provide the necessary quantity of power supplies to satisfy this requirement with the quantity of devices indicated on the plans.

2.07 SYSTEM PERIPHERALS

- A. Every device's address shall be set by means of a rotary-decimal switch using a standard screwdriver. Devices using or requiring binary switches, handheld device programmers or addressed only through software mapping shall not be acceptable.
- B. Smoke detectors
 - 1. General Description:
 - a. UL 268 listed, operating at 24-V dc, nominal.
 - b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - c. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
 - 2. Photoelectric Smoke Detectors:
 - a. Sensor: LED or infrared light source with matching silicon-cell receiver.
 - b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
 - 3. Duct Detectors
 - a. Duct detectors shall be System Sensor DNR or DNRW Series housings.
 - b. Housings and all the related accessories listed below shall be provided for the each of the following:
 - 1) On the ductwork of every supply branch of every HVAC air handling/rooftop unit exceeding 2,000 CFM
 - 2) On the ductwork of every return branch of HVAC air handling/rooftop unit exceeding 2,000 CFM. Where duct detectors cannot be practically or effectively installed on return ductwork, securely fasten the duct detector on the side of the AHU and install and secure its sampling tube across the front of the return air filter.
 - 3) On every shown smoke and fire/smoke damper. Where duct detectors cannot be practically installed on dampers consult with the general contractor to coordinate their installation with other trades.
 - c. The housing shall include the listed addressable photoelectric smoke detector head which shall twist in and lock inside the housing.
 - d. Provide System Sensor DST Series sampling tube of enough length to extend 75% of the width of the duct it is being installed in. Sampling tubes in ducts exceeding widths of 6 feet shall exceed and install across the entire width of the duct and be supported by drilling a hole in the opposite side of the ductwork.
 - e. A System Sensor model RTS151KEY module shall be installed for each duct detector. Provide phenolic labels identifying the related HVAC unit it is connected to. The RTS151KEY module shall mount in a standard single gang electrical box. Verify and coordinate location of RTS151KEY modules with architect.
 - f. Provide one addressable relay module for each HVAC required function including:

- 1) AHU Shutdown
 - 2) Smoke damper operation
 - 3) Smoke sequence/exhaust/pressurization operations
- g. System designs incorporating hardwired, conventional relays for any mechanical functions are not allowed and will be subsequently rejected.

C. Pull Stations

1. Shall be fully listed and compatible with the furnished system, dual action, and constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters.
2. Stations shall be designed so after actuation they cannot be restored except by key reset.
3. Stations shall be keyed alike with the fire alarm control panel and NAC power supply.
4. Surface boxes shall be available as an option from the manufacturer.
5. Pull stations shall not utilize glass rods.

D. Thermal Detectors

1. Shall be listed and compatible with the furnished system.
2. Detector shall be rated at 135 degrees and shall have rate of rise element rated at 15 degrees per minute.
3. UL521 listed

E. Beam-Type Smoke Detector: Each detector shall consist of a separate transmitter and receiver, and shall have the following features:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Adjustable Sensitivity: At least six sensitivity levels, settable at the receiver, measured as percent of obscuration.
3. Two selectable alarm delay settings, allowing each to be associated with a corresponding sensitivity.
4. Separate Color-Coded LEDs: Indicate normal, alarm, and trouble status with remote indicator panels.

F. Addressable Monitor Modules

1. Where required provide addressable monitor modules to monitor normally open dry contacts from other non-addressable equipment.
2. Module shall be suitable for installation on a standard 4" square electrical box 2-1/8" deep and shall include the manufacturer's matching cover plate.
3. An LED shall be visible on the outside of the module's cover plate and shall flash under normal conditions and remain on steady when it's connected device is in alarm.
4. Modules not suitable for mounting directly onto a 4" square electrical box or those which wire with pigtail type connectors are not acceptable.

G. Supervised Addressable Output Module

1. Provide addressable supervised output module where required for the project to provide a supervised, programmed 24volt DC reverse polarity output.
2. Module shall be suitable for installation on a standard 4" square electrical box 2-1/8" deep and shall include the manufacturer's matching cover plate.

3. An LED shall be visible on the outside of the module's cover plate and shall flash under normal conditions and remain on steady when the module is activated.
- H. Addressable Relay Output Module
1. Provide addressable modules suitable for installation on a standard 4" square electrical box 2-1/8" deep and shall include the manufacturer's matching cover plate.
 2. The module shall provide two isolated sets of Form-C normally open and normally closed contacts
 3. Contact ratings shall be rated at minimum 2.0 amps resistive or 1.0 amp inductive
 4. An LED shall be visible on the outside of the module's cover plate and shall flash under normal conditions and remain on steady when the module is activated.
- I. Audio Visual Notification Appliances
1. Shall be System Sensor SpectrAlert Advance Series listed for use on both wall and ceiling as indicated on the plans.
 2. Provide devices white in color with red FIRE screened on device from manufacturer.
 3. Audio visual devices shall be one complete assembly utilizing a speaker for audible notification for this project.
 4. The device shall be suitable for mounting on standard electrical boxes using the manufacturer's universal mounting plate. The strobe device shall snap into the mounting plate and secured by one fastener.
 5. The manufacturer's mounting plate shall include screw terminals to accept all field wiring.
 6. Candelas shall be selectable in settings of 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177 and 185.
 7. The strobe shall be listed to U.L. 1971 standards and meet all current ADAAG Guidelines.
 8. The horn shall be listed to U.L. 464 approved for fire protective service and shall have three audibility options and an output to switch between a temporal three pattern and a non-temporal continuous pattern.
 9. Provide manufacturer's surface mount and weatherproof backboxes where required.
- J. MAGNETIC DOOR HOLDERS
1. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
 - a. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
 - b. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 - c. Rating: 24-V ac or dc.
 2. Material and Finish: Match door hardware.

2.08 WIRE AND CABLE

- A. The following are acceptable manufacturers:
1. Windy City Wire
 2. General Cable

- B. Cable shall be approved for plenum use without conduit per the NFPA 262 Flame Test
- C. Cable shall be approved per NEC 800, 760; UL, CMP, FPLP UL, RoHS Complaint

PART 3.00 EXECUTION

3.01 EXAMINATION

- A. Examine areas and surfaces to receive fire alarm system.
 - 1. Notify Architect of conditions that would adversely affect installation or subsequent use.
 - 2. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

- A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicated on the Drawings.
- B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.
- C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.
- D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.
- E. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, not more than 48 inches, above finished floor measured to operating handle.
- F. Duct-Mounted Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- G. Heat Detectors in Elevator Shafts: Coordinate temperature rating, thermal response characteristic and location with sprinkler rating and location.
- H. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- I. Smoke- or Heat-Detector Spacing:
 - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing

2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed the listing of the detector.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
5. HVAC: Locate detectors not closer than 5 feet (1.5 m) from air-supply diffuser or 3 feet (1 m) from return-air opening.
6. Lighting Fixtures: Locate centerline of detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.
- B. Testing:
 1. Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
 2. Close each sprinkler system control valve and verify proper supervisory alarm at Control Panel.
 3. Verify activation of flow switches.
 4. Open initiating device circuits and verify that trouble signal actuates.
 5. Open signaling line circuits and verify that trouble signal actuates.
 6. Open and short notification appliance circuits and verify that trouble signal actuates.
 7. Ground initiating device circuits and verify response of trouble signals.
 8. Ground signaling line circuits and verify response of trouble signals.
 9. Ground notification appliance circuits and verify response of trouble signals.
 10. Check installation, supervision, and operation of intelligent smoke detectors.
 11. Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at Control Panel and correct activation of control points.
 12. Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.
- C. Acceptance Testing:
 1. Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.
 2. Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.

3. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
4. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
5. Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within 1 year (365 days) from date of final acceptance by the owner.

3.04 DEMONSTRATION

- A. Provide instruction as required for operating fire alarm system.

END OF SECTION

DIVISION 15 - MECHANICAL AND PLUMBING
SECTION 15000 - GENERAL MECHANICAL

PART 1.00 GENERAL CONDITIONS

1.01 WORK INCLUDED

- A. The general conditions of the general specifications are made a part of these specifications and apply the same as if attached hereto. The contractor should, before bidding, read and thoroughly understand all general conditions, priority and scheduling.

1.02 SCOPE OF WORK

- A. This section calls for the furnishing of labor, materials, equipment, and all the services, and of performing all operations required for the complete mechanical systems as hereinafter specified and/or shown on the accompanying drawings.

1.03 GENERAL REQUIREMENTS

- A. Contractor shall install his work to meet the existing conditions as found at buildings and property, and to accommodate work of other trades. This contractor shall be responsible for timely placing of sleeves in forms before concrete is poured. Cooperate with the general contractor and place pipes and ducts in floors, walls, furred spaces, etc., so there will be no delay. Sheet metal or iron pipe sleeves shall be provided for pipes passing through floors, wall or partitions.
- B. Contractor shall furnish and properly install materials, devices, equipment, insulation, controls, appurtenances, etc., mentioned in these specifications and/or shown on plans or required to make a complete and satisfactory installation in working order whether fully shown or not.
- C. Contractor should visit the site and acquaint himself thoroughly with conditions governing installation of his work. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the spaces available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.
- D. All other plans shall be checked in relation to these plans so that all conditions will be furnished and installed in this contract to provide complete and satisfactory systems.
- E. It is intended that all HVAC devices, piping, etc. be located symmetrically with all architectural elements. Refer to Architectural, Structural, Electrical, Plumbing plan and details in completing the required coordination.

1.04 LAWS, RULES, REGULATIONS, FEES, ETC.

- A. The entire mechanical work shall comply with rules and regulations of the local and state authorities having jurisdiction including the State Fire Marshal, State Board of Health, and Department of Health and Hospitals. All modifications required by the said authorities at

any time shall be made by the mechanical contractor without additional charge. In cases where alterations to or deviations from this specification and accompanying plans are required by the authorities, contractor shall report same to the Architect and obtain his approval before work is started.

1.05 DRAWINGS

- A. Plans and detail sketches are submitted to limit, explain, and define structural conditions, specified requirements, pipe sizes, and manner of erecting work. Structural or other conditions may require certain deviations from manner of installation shown, and such deviations shall be made as required, but specified sizes and requirements necessary for satisfactory operation shall remain unchanged.
- B. It may be necessary to shift or to change routing of ducts and or piping and this shall be done, but such changes must be referred to Architect for approval before proceeding. Extra charges will not be allowed for these changes.
- C. Typical details are shown on plans, and in any cases where Contractor is not certain about the method of installation of this work, he shall ask for details, lack of details will not be an excuse for improper installation.
- D. Contractor bidding on this portion of the work must be fully experienced in installations of equal size, complexity and quality. In bidding, he acknowledges that he fully understands the scope of the work and design and has the ability, for the contract price to assemble and install the equipment, piping, and ductwork shown or specified, so as to mold same into a satisfactory workable system and arrangement, without responsibility for capacities and sizes set by these documents.
- E. Contractor shall recognize that the amount of information and detail that could be provided in Contract Documents is limitless and could extend into every minute detail, step, sequence, and operation to a point where only workmen would be required, without drawing on ability experience, and ingenuity of the Contractor.
- F. The drawings indicate required size and points of termination of piping and ductwork, and suggest proper routes to conform to structure avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of the contractor to make the installation in such a manner as to conform to the structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instructions or cost to the Owner.

1.06 MATERIALS

- A. Where directed by the Architect, Contractor shall submit sample for approval before proceeding.

1.07 STANDARDS

- A. In general, standards for products and workmanship shall be as described in each individual section.

- B. The standards referred to, except as modified in these specifications shall have full force and effect as though printed in these specifications. These standards are not furnished to bidders for the reason that the manufacturers and trades involved are assumed to be familiar with their requirements. The Architect will furnish, upon request, information as to how copies of the standards referred to may be obtained.
- C. Notwithstanding any reference in this section of the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalogue number, such references shall be interpreted as establishing a standard of quality and shall not be construed 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.

1.08 MATERIALS SPECIFIED OR SUBSTITUTED (Prior Approvals)

- A. Refer to Instructions to Bidders.

1.09 SHOP DRAWINGS

- A. Before proceeding with the work, contractor shall make complete shop and working drawings of such apparatus or connections as directed by the Architect and/or hereinafter specified. These drawings shall show construction details and dimensions of each piece of equipment so drawn.
- B. Architects approval of shop drawings shall not relieve the Contractor from responsibility of incorrectly figured dimensions or any other errors in these drawings or specified even though approved by the Architect, shall not relieve this Contractor from furnishing and erecting same.
- C. Ten (10) sets of prints of shop drawings shall be submitted to Architect. These prints shall be supplied as part of this contract. Submit all shop drawings at the same time or as soon as practical after award of the contract. No separate items will be accepted.
- D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such accessories shall be furnished if no specific reference to them is made in the specifications.
- E. Contractor shall verify voltage of all equipment with Electrical prior to ordering.

1.10 CUTTING AND PATCHING

- A. All cutting necessary for this work will be done by this Contractor at his own expense, but all patching shall be done by the General Contractor. No beams or joists shall be cut without prior approval of Architect. After initial resurfacing has been done any further cutting, patching or painting shall be done at the expense of this Contractor.

1.11 INTERFERENCES

- A. The drawings are generally diagrammatic and this Contractor shall harmonize his work with that of the different trades so that interferences of the different equipment, piping, etc., shall be installed so as to function properly. In the case where interference develops, the Architect is to state which equipment, piping, etc., is to be relocated regardless of which item was first installed.

1.12 EXCAVATION AND BACKFILL

- A. This Contractor shall do all excavating required to lay the specified services and after same have been laid, he shall do all backfilling to the satisfaction of all parties concerned and shall cart away from the premises all unnecessary dirt, rubbish, etc., as directed. Backfill shall be well tamped. All backfill shall be done according to the "Compaction And Backfill" section of these specifications.

1.13 SPACE REQUIREMENTS

- A. Contractor shall check all plans pertaining to this job so as to be fully aware of the space limitations for all various items of equipment. Equipment is not to be bid on, submitted for preliminary approval nor placed on the job if it is so bulky and large that adequate access for proper maintenance and servicing cannot be achieved in the space provided.

1.14 FOUNDATIONS AND SUPPORTS

- A. This contractor shall furnish and install foundations and supports of concrete or steel shapes for equipment requiring same, unless specifically indicated otherwise or specified.
- B. All floor mounted mechanical equipment shall be mounted on 4" high concrete housekeeping pad unless specifically shown otherwise on plans. Refer to plans for special requirements for foundations and supports.

1.15 HANGERS, ESCUTCHEONS, ETC.

- A. See Section 15140 – Supports and Anchors.
- B. Mechanical Contractor shall furnish and install all thimbles, inserts and other requirements necessary for the support of his equipment and piping. Assist and cooperate with other trades in locating and placing these items.

1.16 CEILING AND WALL ACCESS PANEL

- A. Factory made access doors and frames, prime coat finish, screw driver latch(s) of suitable size as required.
- B. Access panels in rated ceiling to have same rating as ceiling.
- C. Where valves, dampers, controls, fire dampers, smoke dampers, and detectors, reheat coils, etc. are concealed in walls or non-accessible ceilings, install factory made access doors and frames.

1.17 DUCTWORK ACCESS PANELS

- A. Access panels in ductwork to be double wall type with insulation sandwiched in between, same insulation value as adjacent ductwork.

1.18 SIPHON PREVENTERS

- A. Furnish and install approved type siphon preventors on all equipment and fixtures in such a manner as to prevent water being siphoned back into the water supply in the event the water supply is shut off.

1.19 FLAME SPREAD PROPERTIES OF MATERIALS

- A. All materials and adhesives used for acoustical linings, jackets and insulation shall comply with requirements of NFPA 90A and 90B and UL guide # 40V.8.15. Products exceeding a flame spread rating of 25, or a smoke developed rating of 50, as determined by ASTM Test Method E-84 are prohibited. Adhesives and sealers shall be fire retardant and fire resistant when dry. Flame proofing treatments which are subject to decomposition, deterioration, or the effects of moisture are prohibited.

1.20 DOMESTIC AND FIRE WATER TIE-IN

- A. Contractor shall provide any necessary meters and tap fees for domestic or fire water tie-ins to utility companies. All domestic and fire water taps shall have aboveground reduced pressure back flow preventors near the tie-in point. Coordinate with Engineer exact location.
- B. All backflow preventors shall be heat traced and insulated with 1-1/2" fiberglass insulation with water tight aluminum jacket.

1.21 PROTECTION OF EQUIPMENT

- A. See individual sections for protection of equipment.
- B. This Contractor shall at all times take such precautions as may be necessary to properly protect his equipment from damage. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Architect will be sufficient cause for the rejection of the particular piece of equipment in question.

1.22 TESTING

- A. All pressure lines, unless elsewhere specified, shall be tested under 150# hydrostatic pressure unless rated pressure is less for a minimum of 5 hours. Contractor shall provide valve at farthest point in line to bleed off air and for inspection.
- B. Notice shall be given the Architect before tests are made, the test is not to be drawn off pipes and pipes are not to be covered or insulated until filled pipes have been examined and testing approved by the Architect.

- C. In case of defects, they shall be made good to the satisfaction of the Architect and work retested. All such work shall be done by the Contractor with no additional expense to the Owner.
- D. Contractor shall make any other such tests as may be called for by the Architect, and all other tests so called for elsewhere in these specifications.

1.23 CLEANING AND ADJUSTING

- A. Before receiving final approval from the Architect, the Contractor shall clean out all lines; adjust all valves, control equipment and other equipment. Clean all pipe and equipment and leave the entire installation in good working order. All heaters, fans, grilles, controls, etc., shall be adjusted to perform in correct and satisfactory manner, with sequences, etc., as called for in the specifications hereinafter specified and on plans.

1.24 PAINTING

- A. Refer to Section 09900 – Painting and Coating and 15190– Mechanical Identification for painting requirements.

1.25 MOTORS, MOTOR STARTERS AND ELECTRICAL WORK

- A. Refer to Section 15170 - Motors.
- B. Motors shall be suitable for voltage indicated on the plans, plus or minus 10% and be designed for constant operation at 40 degrees C ambient, 65 degrees C rise for class A, 90 degrees C rise for Class B, etc. Electrical equipment furnished under this contract shall meet standards as set forth by NEMA and NEC requirements. All electrical equipment shall be UL labeled.

1.26 PARTS LIST AND INSTRUCTION MANUAL

- A. See individual sections for specific instructions.
- B. This Contractor shall deliver to the Architect three (3) copies of printed instructions relating to operating, proper maintenance and repair parts list indicating the various parts by name, number and diagram for each piece of equipment installed. Test and balance report shall also be included in parts list and instruction manual.
- C. The shop drawings, parts list, and maintenance and repair instructions shall be neatly bound in a canvas-covered notebook and turned over to the Architect before acceptance of the work.

1.27 GUARANTEE

- A. Contractor shall guarantee materials, equipment and workmanship installed and performed under this contract for a period of one (1) year from date of the final completion and official acceptance of the contract unless otherwise stated.

- B. He shall furnish free of charge to the Owner all materials and labor necessary to comply with the above guarantee, which shall be based on defective materials and/or workmanship, and on such basis shall be responsible if a deficiency is found, for any adjustment, replacement, or correction which may be necessary to replace the project to first class condition. This guarantee shall include refrigerant charges, but shall not include the changing of filters.

1.28 RECORD DRAWINGS

- A. The Contractor shall maintain a set of record drawings on-site throughout the construction. The record drawings shall reflect accurate dimensional record of all underground, buried, above ceiling, or otherwise concealed work.
- B. The Contractor shall maintain these record documents and keep them up-to-date daily.

END OF SECTION

DIVISION 15 - MECHANICAL AND PLUMBING

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1.00 GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Mechanical demolition.
 - 8. Equipment installation requirements common to equipment sections.
 - 9. Concrete bases.
 - 10. Supports and anchorages.

1.02 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.03 SUBMITTALS

- A. Welding certificates.

1.04 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2.00 PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.03 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.

- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.04 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Carbon steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.05 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.06 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated and rough brass.

2.07 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3.00 EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.

- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.03 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.05 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement.

3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

- C. Field Welding: Comply with AWS D1.1.

3.07 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.08 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15170 - MOTORS

PART 1.00 GENERAL

1.01 SECTION INCLUDES

- A. Single phase electric motors.
- B. Three phase electric motors.

1.02 RELATED WORK

- A. Section 15860.

1.03 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.
- D. ANSI/NEMA MG 1 - Motors and Generators
- E. ANSI/NEMA 70 - National Electrical Code

1.04 SUBMITTALS

- A. Submit product data under provisions of Sections 01300 - Administrative Requirements & 15000 – General Mechanical.
- B. Submit test results verifying nominal efficiency and power factor for three phase motors larger than 5 horsepower.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01700 - Execution Requirements.
- B. Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacture of electric motors for commercial use, and their accessories, with documented product development, testing, and manufacturing experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600– Product Requirements.
- B. Store and protect products under provisions of Section 01600– Product Requirements.
- C. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. (For extended outdoor storage, remove motors from equipment and store separately).

1.09 WARRANTY - See General Section 15000 – General Mechanical.

PART 2.00 PRODUCTS

2.01 MOTORS

- A. Motors controlled by VFD's shall comply with NEMA MG1, Part 31, Definite Purpose Inverter Fed Motors (withstand repeated voltage peaks of 1600V with rise times of 0.1 microseconds and greater).
- B. Starters for single phase motors which are not automatically started shall be manual type with melting alloy thermal overload protection and pilot light. Starters for automatically controlled single phase motors shall be magnetic type with NEMA rated AC magnetic contactor, melting alloy thermal overloads and pilot light.
- C. Starters for three phase motors 25 horsepower and below shall be combination type starter/disconnect, full voltage non reversing (FVNR), with magnetic NEMA rated contactors rated for horsepower of motor served, adjustable trip magnetic circuit breaker disconnect (circuit breaker, not a fused switch) capable of being padlocked in the open position, 10K a/c minimum fault rating with higher rating when necessary due to available fault levels. Starters shall have a fused 100VA minimum control transformer (120V unless required otherwise), HOA switch, push to test operating pilot light, solid state overload relays set for actual motor nameplate full load amps, phase failure and phase reversal protection relay, minimum two NO. and two N.C auxiliary contacts and terminal blocks factory prewired for field wiring. Starters shall be housed in a NEMA 1 enclosure for indoor locations and NEMA 3R enclosure for outdoor or wet locations.
- D. Starter for motors 30 horsepower and above shall be soft start type or variable frequency drives
- E. Coordinate with electrical and specify fault rating on all motor controllers.

2.02 MANUFACTURERS

- A. Electrical Service - Refer to Division 16 for required electrical characteristics.

- B. Motors: Design for continuous operation in 40 degrees C environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, Service Factor, and motor enclosure type.
- C. Visible Nameplate: Indicating motor information as required by NEC 430-7(a).
- D. Electrical Connection: Conduit connection boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide screwed conduit connection in end frame.
- E. Starters:
 - 1. General Electric
 - 2. Square-D
 - 3. Westinghouse
 - 4. Allen-Bradley
 - 5. Furnas

2.03 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A 65 degree C temperature rise insulation, Minimum 1.15 service factor, pre-lubricated sleeve or ball bearings, automatic reset overload protector.

2.04 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; capacitor-start/capacitor-run motors shall have two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A 65 degree C temperature rise insulation, NEMA service factor, prelubricated sleeve ball bearings.
- G. Enclosed Motors: Class A 65 degree C temperature rise insulation, NEMA service factor, prelubricated sleeve ball bearings.

2.05 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between one and one-half times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to ANSI/NEMA MG for design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with ANSI/IEEE 12, Test Method B. Load test motors to determine freedom from electrical or mechanical defects and compliance with performance data.
- G. Motor Frames: NEMA standard T-frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- H. Thermister System (Motor Frame Sizes 254T and larger): Three PTC thermister imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter.
- I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for re-lubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- J. Sound Power Levels: To ANSI/NEMA MG1.
- K. Nominal Efficiency: Meet or exceed values in schedules at full load and rated voltage when tested in accordance with ANSI/IEEE 112, and ASHRAE 90.1.
- L. Motors, Motor Starters and Electrical Work: Mechanical Contractor shall furnish all motors, motor starters, start-stop push buttons, pilot lights, firestats, interlocking diagrams, etc. for each piece of motor driven equipment under this Contract. Mechanical Contractor shall install all motors. All motor starters, start-stop push buttons, pilot lights, etc. shall be turned over to the Electrical Contractor for installation. Electrical contractor shall be responsible for power wiring. This contractor will be responsible for control wiring.
- M. Motor Starters and Push Buttons: All automatic starters shall be nominal 600 volt rating. All starters shall have two (2) auxiliary contacts.
 - 1. Starters for single speed motors, 3/4 through 25 HP inclusive, shall be magnetically operated, "Across-the-line" 3 phase, with three overload relays, "HAND-OFF-AUTO" selector switch and pilot in cover. Starters shall be combination type with fused or circuit breaker type disconnect mechanism.
 - 2. Starters for 30 HP and larger are to be reduced voltage, auto-transformer,

combination type with fused or circuit breaker type disconnect mechanism. Starters shall be complete with three overload relays, "HAND-OFF-AUTO" selector switch and pilot lights.

3. Enclosures for starters mounted indoors shall be NEMA 1. Enclosures for starters mounted outdoors or in wet areas shall be NEMA 3 R.
4. Remote push button stations shall be as follows: Start-stop stations shall be recess mounted with neon pilot lamp of proper voltage.
5. Push buttons for controls which are interlocked with automatic controls shall be maintained contact type. All others may be of momentary contact type.
6. Control voltage for all motor starters shall 120 volts provided by integral control voltage transformers.
7. If the Mechanical Contractor purchases equipment of larger horsepower than specified or shown on the plans, he shall pay all costs to increase the wiring and conduit.

PART 3.00 EXECUTION

3.01 APPLICATION

- A. Motors drawing less than 250 watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these specifications.
- B. Motors shall be open drip-proof type, except where specifically noted otherwise.
- C. Single phase motors for shaft mounted fans or blowers shall be permanent split capacitor type.
- D. Mount motor starter in their own individual enclosures or in a factory-built starter panel.

3.02 NEMA OPEN MOTOR SERVICE FACTORS

HORSEPOWER	3600 RPM	1800 RPM	1200 RPM	900 RPM
1/6-1/3	1.35	1.35	1.35	1.35
1/2	1.25	1.25	1.25	1.15
3/4	1.25	1.25	1.15	1.15
1	1.25	1.15	1.15	1.15

3.03 MOTOR EFFICIENCY

- A. Each motor furnished on the job must meet ASHRAE 90.1 and shall have a minimum guaranteed efficiency as listed in table below. Minimum guaranteed efficiencies for all motors shall be clearly stamped on motor nameplate. The lack of such stamp shall be cause for rejection of motor.

=====	
HORSEPOWER	EFFICIENCY
=====	
1, 1-1/2, 2	84.00

3	88.50
5, 7-1/2, 10	90.20
15, 20	91.70
25, 30, 40	93.00
50, 60, 75	94.10
100, 125, 150, 200	95.00

END OF SECTION

DIVISION 15 - MECHANICAL AND PLUMBING
SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1.00 GENERAL

1.01 WORK INCLUDED

- A. Identification of all mechanical products installed under this Division.

1.02 RELATED WORK

- A. Section 09900 - Painting: Identification painting.

1.03 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01300– Administrative Requirements.
- B. Mechanical and plumbing contractors shall coordinate color codes and marking procedures.

1.05 APPROVAL OF PRODUCT PRIOR TO BIDDING

- A. Refer to Instructions to Bidders, Page IB-3, Paragraph 4.3 Substitution.

PART 2.00 PRODUCTS

2.01 MATERIALS

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Metal Tags: Brass with stamped letters, tag size minimum 1-1/2 inch (38 mm) diameter with smooth edges.
- D. Stencils: With clean cut symbols and letters of following size:

=====		
OUTSIDE DIAMETER OF INSULATION OF PIPE	LENGTH OF COLOR FIELD	SIZE OF LETTERS
=====		
3/4" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"

8" - 10"	24"	2 - 1/2"
Over 10"	32"	3 - 1/2"
Ductwork & Equipment	-----	2 - 1/2"

- E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing printed markings.
- F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6" wide by 4 mil thick manufactured for direct burial service.

PART 3.00 EXECUTION

3.01 PREPARATION AND INSTALLATION:

- A. Degrease and clean surfaces to receive adhesive for identification material.

3.02 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.
- B. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- C. Plastic type Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- D. Underground Plastic Pipe Markers: Install 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- E. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks and water treatment devices, and motor starters with plastic nameplates. Small devices, such as in-line pumps, may identified with plastic tags.
- F. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- G. Valves: Identify valves in main and branch piping with tags.
- H. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Tags may be used on small diameter piping. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side penetration of structure or enclosure, and at each obstruction.

3.03 PAINTING

- A. All surfaces requiring painting shall be left clean. All painting shall be done by the General Contractor's painting Subcontractor. All exposed piping or insulation, convectors, grilles, or fans, in building or on roof will be painted. Paint pipe, equipment, hangers and accessories in Equipment Rooms including covering and foundations with two (2) coats of approved

paint after thoroughly cleaning. Equipment having factory finish shall be touched up and given one (1) additional coat of machinery enamel color as selected. The above shall be done by the General Contractor. See Section 09900.

- B. All piping in all equipment rooms shall be identified with pipe markers with directional arrows. The following color code shall be followed.

LEGEND	PIPING	DIRECTIONAL MARKER	BAND COLOR BACKGROUND
Domestic Water	Green	Green	White

NOTE: On any asphalt finished surfaces, prime with one (1) coat of aluminum paint before final color.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15260 - PIPING AND EQUIPMENT INSULATION

PART 1.00 GENERAL

1.01 WORK INCLUDED

- A. Piping Insulation
- B. Jackets and Accessories
- C. Equipment Insulation
- D. Duct Insulation

1.02 RELATED WORK

- A. Section 15890 - Ductwork

1.03 REFERENCES

- A. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation
- B. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- C. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate
- D. ASTM E845 - Surface Burning Characteristics of Building Materials.
- E. NFPA 255 - Surface Burning Characteristics of Building Materials.
- F. UL 723 - Surface Burning Characteristics of Building Materials.

1.04 QUALITY ASSURANCE

- A. Applicator: Company specializing in application of piping insulation.
- B. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with ASTM E84, NFPA 255.0, UL 723.

1.05 SUBMITTALS

- A. Submit product data for each application as per Section 01300.
- B. Submit manufacturer's installation instructions.

PART 2.00 PRODUCTS

2.01 INSULATION

- A. After all work has been tested and found to be leak free and tight, and accepted by the Architect, insulate as follows:
1. All domestic hot and cold piping above ground shall be covered with 1" thick fiberglass, molded type sectional pipe covering complete with FRJ jacket. Sections of pipe covering shall be joined together, the mastic to be buttered on only one of the two adjoining surfaces at both the Longitudinal and circumferential joints so that a complete seal at the joints is obtained. The piping insulation will be secured in place with copper wire spaced not more than 12 on center. All domestic water piping insulation shall be continuous. Contractor shall not cut insulation to fit around structural items. No exceptions.
 2. Insulate the square to round connections on each air handling unit with 3" thick 3/4 lb. density insulation board using stick pins randomly spaced 18" apart. Insulation board shall have aluminum vapor barrier.
 3. Fittings, flanges, valves, etc., shall be covered with molded or fabricate covers of same material as pipe covering and shall be finished with two (2) coats of white vapor barrier mastic reinforced with 20-20 mesh glass fabric.
 4. Insulate all VAV boxes, rectangular supply, return, exhaust, and fresh air ducts with 3" thick 3/4 lb. density fiberglass insulation with reinforced aluminum vapor barrier. Seal all joints with duct tape.
 5. All round and flat oval supply air ducts shall be wrapped with 3" thick, 3/4 lb. density fiberglass insulation with reinforced aluminum vapor barrier. Seal all joints with 2" duct tape.
 6. Insulate cooling coil condensate drain lines from air handling units with 1/2" thick aerotube type insulation tied on and sealed over with tape.
 7. Insulate back of all ceiling diffusers with 3" thick fiberglass with reinforced aluminum vapor barrier.
 8. All outdoor mechanical piping shall be covered with aluminum jacket, water tight.

PART 3.00 EXECUTION

3.01 PREPARATION

- A. Install materials in accordance with manufacturer's instructions.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Continue insulation with vapor barrier through penetrations.
- C. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- D. Neatly finish insulation at supports, protrusions, and interruptions.

END OF SECTION 15260

DIVISION 15 - MECHANICAL
SECTION 15300 - FIRE PROTECTION SYSTEM

PART 1.00 GENERAL

1.1 WORK INCLUDED:

- A. The General Conditions of the Contract and Supplementary Conditions of the Contract shall govern the work under this Section of the Specifications. The Contractor is specifically directed to refer to said conditions.
- B. It is understood that these specifications, and the accompanying drawings, complement complete apparatus, fully erected and in successful operating condition. All work must be preformed in the best and most substantial manner.
- C. These specifications are intended to provide complete, and in proper operation, all sprinkler system piping, equipment, heads, valves, controls, air compressor, and accessories, all as specified herein or shown on the accompanying drawings, or reasonably implied in either. The building shall be provided with complete coverage sprinkler system for the spaces designated on the drawings classification as required. System shall consist of a calculated dry system unless indicated otherwise. Verify all pertinent criteria. The systems shall conform to layout shown and meet all requirements of agencies listed under "REGULATIONS AND STANDARDS" below. Refer to plans and specifications for additional information.
- D. Pipe, fittings, valves, and connections for fire protection and sprinkler systems shall be furnished by fire protection contractor.

1.2 RELATED WORK:

- A. Section 15310 - Wet-pipe Sprinkler Systems.

1.3 SYSTEM LAYOUT:

- A. Where plans indicate layout of system components, the layout shall be verified to comply with "REGULATIONS AND STANDARDS" and shall be revised if required to comply. The location of the sprinkler system piping and components shall be coordinated with all other trades. Revisions to sprinkler system layout shall be at Sprinkler Contractor's expense. Any such revisions shall be verified with the Architect.

1.4 ELECTRICAL WORK:

- A. See "COORDINATION".

1.5 SPRINKLER SYSTEM CONTRACTOR:

- A. It is intended that the work under this section is to be preformed by a qualified Fire Protection Piping Systems Contractor regularly engaged in this type of work. The Contractor is to hold a

current license to perform this work and be certified by the State Fire Marshall. All documents shall bear this certification.

1.6 REGULATIONS, STANDARDS AND REFERENCES:

- A. It is the intention of these specifications and the accompanying drawings, that all elements and features of the fire protection system shall be in accordance with the standards of the National Fire Association (NFPA), the State Fire Marshall, all applicable building codes and Property Insurance Association of Louisiana whether so indicated or not. NFPA standards are on file in office of Engineer and may be examined at the Contractor's request.
- B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 150.
- C. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150. Interior of building.
- D. Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- E. NFPA 13 - Installation of Sprinkler Systems.
- F. NFPA 14 – Standpipe and Hose Systems.

1.7 QUALITY ASSURANCE:

- A. Conform to NFPA 13 for sprinkler systems.
- B. Conform to NFPA 14 for standpipe hose systems.
- C. Welding Materials and Procedures: Conform to ASME Code.
- D. Employ certified welders in accordance with ANSI/ASME Section 9. AWS D10.9.
- E. Valves: Bear UL FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.8 SUBMITTALS:

- A. Submit product data under provisions of section 01300.
- B. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.
- C. Indicate valve data and ratings.

1.9 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver and store valves in shipping containers, with labeling in place, under provisions of Section 01600.

- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures. Maintain in place until installation.

1.10 AREAS SUBJECT TO FREEZING:

- A. For areas requiring protection and not receiving direct heating during times of potential freezing, such as building overhangs, porches, canopies, attics, etc. provide a compressed air dry pipe system for these areas only, see drawings for locations. Coordinate electrical requirements with contractor.

1.11 MANUFACTURER'S OR TRADE NAMES:

- A. Where the plans or specifications mention the names of manufacturers or the products of specific manufacturers, it is intended that the Contractor shall furnish the item or items as specifies. Products of manufacturers that are not mentioned shall be subject to prior review by the Engineer and shall in any case mentioned shall be subject to prior review by the Engineer and shall in any case be in accordance with regulations and standards as state above.

1.12 SHOP DRAWINGS AND SUBMITTAL DATA:

- A. Within fifteen (15) days of award of the contract, the contractor shall submit six (6) copies of system piping shop drawings and six (6) copies of manufacturer's data and descriptive literature and drawings for all equipment and materials. Additionally, provide a reproducible (sepia) copy of the system piping shop drawings. All drawings, literature and data on all equipment shall be submitted at the same time; this material shall contain complete layout, capacity data, dimensions and other pertinent information necessary for the Architect to properly review and evaluate the item that necessary to meet the requirements for submittal to the State Fire Marshall.
- B. The contractor shall obtain approval of agencies listed under "REGULATIONS AND STANDARDS" before submitting to the Engineer, except that the date for State Fire Marshall's review shall be submitted to the Engineer prior submitting to the Fire Marshall. All required review fees and applicable requirements shall be by the contractor. No item of equipment or material shall be place on order until Final Review comments have been received from the Architect. See "DRAWINGS" below.

1.13 ORDINANCES, RULES AND REGULATIONS:

- A. All material and construction shall conform to the requirements of all building, plumbing and sanitary codes and laws in force in the locality in which the work is to be done. All materials and construction shall also conform to the rules and regulations listed above under "REGULATIONS AND STANDARDS".

1.14 DRAWINGS:

- A. The contractor shall submit detailed drawings for all sprinkler system showing exact locations

and sizes of all elements in the system before fabrication is begun. Engineer shall have the prerogative of changing the position or configuration of these systems without changing the total scope of work involved to comply with "REGULATIONS AND STANDARDS".

1.15 GUARANTEE:

- A. The contractor shall guarantee all materials and workmanship under this contract for a period of one (1) year from date of final acceptance of his work and shall repair or replace any such defective materials and workmanship without cost to the Owner.
- B. The guarantee shall include complete service, including adjustment service and inspection, during the guarantee period as required by agencies listed under "REGULATIONS AND STANDARDS".

1.16 APPROVAL OF PRODUCT PRIOR TO BIDDING

- A. Refer to Instructions to Bidders, Page IB-3, Paragraph 4.3 Substitutions.

PART 2.00 PRODUCTS

2.1 PIPE AND TUBE:

- A. See Section – 15310 Wet-pipe Sprinkler System
- B. Underground pipe shall be C900 to within 5' of building

2.2 PIPE FITTINGS:

- A. Steel Fittings: ANSI/ASME B16.9, wrought steel, butt welded. ANSI/ASME B16.25, butt weld ends. ASTM A234, wrought carbon steel and alloy steel. ANSI/ASME B16.5, steel flanges and fittings. ANSI/ASME B16.11, forged steel socket welded and threaded.
- B. Cast Iron Fittings: ANSI/ASME B16.1, flanges and fittings. B16.4, screwed fittings.
- C. Malleable Iron Fittings: ANSI/ASME B16.3, screwed type. ANSI/ASTM A47.

2.3 JOINT MATERIALS:

- A. Solder: ANSI/ASTM B32, 95/5 alloy.
- B. Brazing: ANSI/AWS A5.8.
- C. Threaded Joint Compound.

2.4 UNIONS, FLANGES, AND COUPLINGS:

- A. Unions: 150 psi malleable iron for threaded ferrous piping.

- B. Flanges: 150 psi forged steel slip-on flanges for ferrous piping.
- 2.5 ACCEPTABLE MANUFACTURER - GATE VALVES:
- A. Nibco 637-31
 - B. Central 722 U Series
 - C. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.
- 2.6 GATE VALVES:
- A. Bronze, rising stem, inside screw, solid wedge.
- 2.7 ACCEPTABLE MANUFACTURERS - GLOBE OR ANGLE VALVES:
- A. Nibco GS-132-U
 - B. Crane 143
 - C. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.
- 2.8 GLOBE OR ANGLE VALVES:
- A. Bronze, rising stem, inside screw, renewable composition disc.
- 2.9 ACCEPTABLE MANUFACTURERS - CHECK VALVES:
- A. NIBCO CS-172
 - B. Crane 147
 - C. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.
- 2.10 CHECK VALVES:
- A. Iron body, bronze trim, swing disc, renewable disc and seat.
- 2.11 ACCEPTABLE MANUFACTURERS - BUTTERFLY VALVES:
- A. Nibco LD 3510-2 Series
 - B. Central Fig. 570 or 580
 - C. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.

2.12 BUTTERFLY VALVES:

- A. Iron body, bronze stainless steel disc and stem extended for insulated work, resilient replaceable liner seat.

2.13 ACCEPTABLE MANUFACTURERS - DRAIN VALVES:

- A. Nibco F-667-0 Series
- B. Central 722 U Series
- C. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.

2.14 DRAIN VALVES:

- A. Brass ball valve with cap and chain, 3/4 inch (19 mm) hose thread.

2.15 VALVE OPERATORS:

- A. Provide handwheels for gate, globe or angle, and drain valves.
- B. For butterfly valves provide gear operators for sizes 8 inches and larger. For smaller sizes provide level lock handle with toothed plate.

2.16 VALVE CONNECTIONS:

- A. Provide valve connections to match pipe joints. Use valves of pipe size.
- B. For copper tube, provide threaded solder adapters for connection to valve.
- C. Provide butterfly valve with tapped lug body when used for isolating service.

2.17 SIAMESE FIRE DEPARTMENT CONNECTIONS:

- A. Provide two-way standard siamese fire department connection with chrome plated finish, local fire department threads, dust caps and chains, 3/4" automatic drip, marked "SPRINKLER - FIRE DEPARTMENT CONNECTION:..

2.18 ACCEPTABLE MANUFACTURERS - SPRINKLER HEADS:

- A. Reliable Automatic Sprinkler
- B. Viking Corp.
- C. Tyco-Fire
- D. Substitutions: Under provisions of Instruction To Bidders, Page IB-3, Paragraph 4.3.

PART 3.00 INSTALLATION

3.1 GENERAL:

- A. Furnish and install in a neat workmanlike manner, all piping shown on drawings or that is specified or required to provide a complete, properly operating installation. All piping and accessories shall conform to standards as applicable.
- B. Run piping parallel with the lines of the building, unless specifically shown or noted otherwise. All pipe, fittings, valves, etc., shall have sufficient clearance from other work to finish at least 1/2 inch from other work or finished covering of other piping.
- C. Provide all necessary hangers, anchors, thrust blocks, etc., to properly support and protect piping system, as required by agencies listed under "REGULATIONS AND STANDARDS".
- D. 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 are to be approved by the Architect/Engineer. All supplement angle or channel iron required to support equipment of this specification is to be furnished by the contractor and is to be independent of any other supports.

3.2 DESIGN:

- A. The sprinkler systems shall be designed as required for occupancies specified by experienced personnel have competency in the execution of such work. Sprinkler system design shall be performed only by licensed sprinkler contractors.
- B. Sprinkler piping shall be protected from freezing.
- C. NFPA rules and regulations governing the design shall be scrupulously adhered to.
- D. Piping shall be installed in accordance with NFPA 13.

3.3 EXECUTION:

- A. Run piping concealed above furred ceiling and in joists to minimize obstructions. Expose only heads.
- B. Coordinate sprinkler piping routing and heads with all trades.
- C. Protect sprinkler heads against mechanical injury.
- D. Include all costs of shop drawings review and approval from authorities in price.
- E. Locate outside alarm on wall of building adjacent to siamese department connections.

- F. Provide cabinet containing required number of spare heads as per NFPA 13, of each type, along with wrench suitable for each type of head.
- G. Provide flow switch on leaving side of main valve and monitoring switch on main valve. Flow switch shall sense flow and sound appropriate zone of fire alarm system monitoring switch on each main valve; when valve is started to its "closed" position shall indicate trouble on appropriate zone of fire alarm system and sound local audible alarm. Wiring between flow switches and monitoring switches and fire alarm system shall be provided under Division 16.
- H. Furnish and install sprinkler zone valves and flow switches where indicated on the drawings for the zoning of the system. Each of these devices shall be connected into the fire alarm system as indicated for the main valve, including local alarming.
- I. Provide all test and drain valves as required per NFPA 13.
- J. Support sprinkler piping in accordance with NFPA 13.
- K. Provide new water service as shown on the drawings.
- L. Install air compressor on vibration isolators, as required.
- M. Screw joint steel piping up to and including 1-1/2 inch diameter. Screw or Roll Goove 2 inch diameter and larger. PER NFPA 13.
- N. Die cut screw 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.
- O. Coat threaded ends with pipe lubricant compound.
- P. Steel piping, main sized saddle branch connections or direct connection of branch lines to mains is permitted if main is one pipe size larger than the branch for up to 6 inch mains and if main is two pipe sizes larger than branch for 8 inch and larger mains.
- Q. Solder Braze copper tubes.
- R. Install piping in accordance with NFPA 13 for sprinkler systems and NFPA 14 for standpipe and hose systems.
- S. Do not penetrate building structural members unless indicated.
- T. Provide sleeves when penetrating footings floors and walls.
- U. Seal pipe and sleeve penetration to achieve fire resistance equivalent to fire separation required.

3.4 INSTALLATION - VALVES:

- A. Install valves with stems upright or horizontal, not inverted.
- B. Provide gate valves for shut-off or isolating service.
- C. Where approved, butterfly valves may be used instead of gate valves.
- D. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.5 SLEEVES AND PLATES:

- A. Wherever pipes pass through concrete slabs, furnish and install sleeves, properly located for the work.
- B. Use sleeves of sufficient size to allow the specified pipe covering to pass through the sleeves and finish sleeves flush with walls and ceiling.
- C. Sleeves shall be galvanized steel not lighter than 24 gauge.
- D. Seal spaces between sleeve and pipe. Use packing device or material for UL rating to match rating of wall or floor/ceiling as rated under UL File R9658.

3.6 ESCUTCHEONS:

- A. Where pipes passing through floors, walls or ceiling exposed to view in finished areas, provide pressed steel split plates which cover the opening and fit snugly to pipe.

3.7 COORDINATION:

- A. All interlock and signal wiring runs to the annunciator panel will be furnished and installed and as part of the Electrical Work.
- B. This contractor shall provide for all switches and interlocking devices on all valves as required.

3.8 UNDERGROUND PIPING:

- A. Underground fire protection system piping shall be installed in accordance with the requirements of NFPA 24, Private Fire Service Mains and Their Appurtenances. Provide concrete thrust blocking at each change of direction of the piping and at all tees, plugs, and caps in accordance with NFPA 24. Where thrust blocking is impractical, fittings with a mechanical joint retainer gland, approved for the piping material utilized, may be used in lieu of thrust blocking.

END OF SECTION 15300

DIVISION 15 - MECHANICAL
SECTION 15310 - WET-PIPE SPRINKLER SYSTEMS

PART 1.00 GENERAL

1.1 WORK INCLUDED:

- A. Installation of new sprinkler and related piping systems in new construction.

1.2 WORK INSTALLED BUT SPECIFIED UNDER OTHER SECTIONS

- A. Section 15300 - Fire Protection Piping: Piping and valves.

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS:

- A. Furnish sleeves to General Contractor.

1.4 RELATED WORK:

- A. Section 15140 - Supports and Anchors.
- B. Section 15242 - Vibration Isolation.

1.5 REFERENCES:

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volt maximum).
- B. NFPA 13 - Installation of Sprinkler Systems.

1.6 SYSTEM DESCRIPTION:

- A. System to provide coverage for entire new building area.
- B. Interface system with building control system. Building fire and smoke alarm system.
- C. Provide system per NFPA 13 hazard requirement.

1.7 QUALITY ASSURANCE:

- A. Design and installation to conform to NFPA 13.
- B. Equipment and components: Bear UL FM label or marking.
- C. Specialist Firm: Company specializing and licensed in sprinkler systems.

1.8 REGULATORY REQUIREMENTS:

- A. Hydraulic Calculations, Product Data, Shop Drawings: Bear stamp of approval of Fire Marshal.

- B. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories.
- C. Submit shop drawings product data hydraulic calculations to Fire Marshal. Submit proof of approval to Architect. Include check for review fee with submittal to Fire Marshal's office.

1.9 PROJECT RECORD DOCUMENTS:

- A. Submit documents under provisions of Section 01700.

1.10 OPERATION AND MAINTENANCE DATA:

- A. Submit manufacturer's operation and maintenance data under provisions of Section 01700.
- B. Include written maintenance data on components of system, servicing requirements, and record drawings.
- C. Include maintenance, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.11 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver and store materials in shipping containers with labeling place under provisions of Section 01600.
- B. Provide suitable wrenches for each head type.
- C. Maintain caps in place until installation.

1.12 EXTRA STOCK:

- A. Provide extra sprinkler heads under provisions of NFPA 13 and Section 01700.
- B. Provide suitable wrenches for each head type.
- C. Provide storage cabinet, size and type as per NFPA-13

PART 2.00 PRODUCTS

2.1 PIPING MATERIALS:

- A. Above Ground Inside Building Piping: Pipe diameter smaller than and up to 2" shall be Steel Schedule 40 pipe, Pipe diameters 2-1/2" and larger shall be Steel Schedule 10 or Steel Schedule 40 pipe, As permitted by NFPA 13.

2.2 ACCEPTABLE MANUFACTURERS - SPRINKLER HEADS:

- A. Reliable Automatic Sprinkler
- B. Viking Corp.
- C. Tyco-Fire
- D. Substitutions: Under provisions of Instruction To Bidders, Page IB-3, Paragraph 4.3.

2.3 SPRINKLER HEADS:

- A. Exposed Area Type: Standard upright type with brass finish.
- B. Sidewall Type: Brass Chrome plated finish with matching escutcheon.
- C. Fusible Link: Temperature rated for specific area hazard.
- D. Guards: finish to match sprinkler head.
- E. Finished ceilings: Pendent sprinklers - concealed type with white cover plates. Unless otherwise noted on plans.

PART 3.00 EXECUTION

3.1 PREPARATION:

- A. Place pipe runs to minimize obstruction to other work.

3.2 INSTALLATION:

- A. Run piping concealed above furred ceiling and in joists to minimize obstructions. Expose only heads.
- B. Coordinate sprinkler piping routing and heads with all trades.
- C. Protect sprinkler heads against mechanical injury.
- D. Include all costs of shop drawings review and approval from authorities in price.
- E. Locate outside alarm on wall of building adjacent to siamese fire department connections.
- F. Provide cabinet containing required number of spare heads as per NFPA 13, of each type, along with wrench suitable for each type of head.
- G. Provide flow switch on leaving side of main valve and monitoring switch on main valve. Flow switch shall sense flow and sound appropriate zone of fire alarm system monitoring switch on each main valve; when valve is started to its "closed" position shall indicate trouble on

appropriate zone of fire alarm system and sound local audible alarm. Wiring between flow switches and monitoring switches and fire alarm system shall be provided under Division 16.

- H. Furnish and install sprinkler zone valves and flow switches where indicated on the drawings for the zoning of the system. Each of these devices shall be connected into the fire alarm system as indicated for the main valve, including local alarming.
- I. Provide all test and drain valves as required for system per NFPA 13.
- J. Support sprinkler piping in accordance with NFPA 13.
- K. Provide new water service as shown on the drawings.

3.3 CLEANING:

- A. Flush entire piping system of foreign matter.

3.4 SYSTEM TESTS:

- A. Hydrostatically test entire system.
- B. Test shall be witnessed by Fire Marshal and Architect.

END OF SECTION 15310

DIVISION 15 - MECHANICAL
SECTION 15410 - PLUMBING PIPING

PART 1.00 GENERAL

1.1 WORK INCLUDED

- A. Pipe and Pipe Fittings
- B. Valves
- C. Sanitary Sewer Piping System
- D. Domestic Water Piping system
- E. Service Connections
- F. Natural Gas Piping System

1.2 RELATED WORK

- A. Section 15000 - General Provisions
- B. Section 15121 - Expansion Compensation
- C. Section 15140 - Supports and Anchors
- D. Section 15260 - Piping Insulation
- E. Section 15430 - Plumbing Specialties
- F. Section 15440 - Plumbing Fixtures and Trim

1.3 REFERENCES:

- A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- B. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- C. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- D. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
- E. ANSI/ASTM B32 - Solder Metal.
- F. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber

Gaskets.

- G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- H. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- I. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- J. ASTM B88 - Seamless Copper Water Tube.
- K. ASTM B306 - Copper Drainage Tube (DWV).
- L. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- M. AWS A5.8 - Brazing Filler Metal.
- N. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.
- O. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary System.
- P. CISPI 310 – Standard for cast iron couplings
- Q. LSPC – The latest addition of the Louisiana State Plumbing Code.

1.4 QUALITY ASSURANCE:

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME Sec. 9. ANSI/AWS D 1.1.
- D. Cast iron pipe and fittings shall be marked with CISPI's collective trademark.

1.5 SUBMITTALS:

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Include data on pipe material, pipe fittings, valves and accessories.

1.6 WATER PIPE AND FITTING MATERIALS STANDARD

- A. Plastic Water Pipe and Fittings
 - 1. ABS and PVC Plastic Tubular Fittings: ASTM F 409, ANSI/NSF 24, ANSI/NSF 14
 - 2. Joints for IPS PVC pipe using solvent cement: ASTM D 2672

3. Chlorinated poly (vinyl chloride) (CPVC) plastic pipe, Schedule 80, 2" and under: ASTM F 441, listed
4. Chlorinated poly (vinyl chloride) (CPVC) plastic pipe (SDR-PR): ASTM F 442
5. CPVC Pipe and fittings: ASTM D 2846, Listed
6. Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) pressure pipe and fittings: ASTM F 1281
7. Cross-linked Polyethylene (PEX) plastic hot and cold water distribution system: ASTM F 877, Listed
8. Cross-linked Polyethylene (PEX) tubing: ASTM F 876
9. Cross-linked Polyethylene (PEX) tubing systems for pressure: CAN/CSA-B137.5M89, listed
10. Flexible Elastomeric pressure joints: ASTM D 3139, See 308.8
11. Metal insert fittings for PB tubing: ASTM F 1380
12. Polyethylene/Aluminum/Polyethylene (PE-AL-PE) pressure pipe and fittings: ASTM F 1282
13. Polyethylene pipe and tubing (PE) Number 2305, 2306, 3306, 3406, 3408: ASTM D 2104, ASTM D 2239, ASTM D 2737, Listed, See 303.8.2
14. Poly (vinyl chloride) (PVC) plastic pipe fittings, Schedule 40: ASTM D 2466
15. Pressure rated ABS-fittings: ASTM D 2468, Listed
16. Pressure rated ABS-pipe Number 1210, 2112, 1316: ASTM D 1527, ASTM D 2282, Listed, See 303.8.2
17. PVC injection molded gasketed fittings for pressure applications: CAN/CSA-B137.2-M89, Listed
18. PVC Pipe, Number 1120, 1220: ASTM D 1785, ASTM D 2241, listed, See 303.8.2
19. PVC socket-type fittings, Schedule 80: ASTM D 2467, listed
20. Socket-type chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 80, 2" and under: ASTM F 439, listed
21. Threaded chlorinated poly (vinyl chloride) (CPVC) plastic pipe fittings, Schedule 80, 2" and under: ASTM F 437, listed

B. Ferrous Water Pipe and Fittings

1. Cast Iron fittings (threaded): ASTM A 126
2. Cast iron pipe (threaded): ANSI A40.5
3. Cast iron water pipe: ASTM A377
4. Ductile-iron water pipe: ANSI/AWWA C 151/A 21.51
5. Ductile-iron water fittings: ANSI/AWWA C 110/A 21.10
6. Malleable iron fittings (threaded): ASTM A 197
7. Nipples pipe (threaded): FS WW-N-351a
8. Stainless steel water pipe Grade H: ASTM A 268, See 303.8.4
9. Steel couplings, threaded, black and galvanized: ASTM A 865
10. Steel pipe black and galvanized: ASTM A 53
11. Welded and seamless steel pipe: ASTM A 53

C. NonFerrous Pipe and Fittings

1. Cast bronze fittings for flared copper tube: ANSI B16.26
2. Cast bronze threaded fittings: ASME B16.15
3. Cast bronze solder-joint pressure fittings: ANSI B16.18

4. Cast copper alloy fittings for flared copper tubes: ASME B 16.26
5. Pipe flanges and flanged fittings: ANSI B16.5
6. Seamless brass tube: ASTM B 135
7. Seamless copper pipe: ASTM B 42
8. Seamless copper tube: ASTM B 75
9. Seamless copper water tube types K, L, & M: ASTM B 88
10. Seamless red brass pipe: ASTM B 43
11. Seamless and welded copper distribution tube (type D): ASTM B 641
12. Threadless copper pipe (TP): ASTM B 302
13. Welded brass tube: ASTM B 587
14. Welded copper tube: ASTM B 447
15. Welded copper alloy UNS # C21000 water tube: ASTM B 642
16. Wrought copper and copper-alloy solder-joint pressure fittings: ASME B 16.22 for copper water tube
17. Wrought seamless copper and rectangular copper-alloy pipe and tube: ASTM B 251, square and tubing not applicable
18. Valves-flanged threaded, and welding end: ANSI B 16.34

D. Backflow Prevention Devices Materials Standard

1. Air gap standards: ASME A112.1.2
2. Backflow preventers, double check valve assembly: ASSE 1015, ANSI/AWWA C510
3. Backflow preventers with intermediate atmospheric vent: ANSI/ASSE 1012
4. Backflow preventers, double check detector assembly: ANSI/ASSE 1048
5. Backflow preventers, hose connection: ANSI/ASSE 1052
6. Backflow preventers, reduced pressure detector assembly: ANSI/ASSE 1047
7. Backflow preventers, reduced pressure principle assembly: ANSI/AWWA C511, ASSE 1013
8. Dual check valve type backflow preventer: ASSE 1032, for carbonated beverage dispensers-post mix type
9. Field test procedures for backflow preventer assemblies: ASSE 5010
10. Manual for the selection, installation, maintenance, and field testing of backflow prevention devices: CAN/CSA B64.10
11. Vacuum breakers, Anti-Siphon, pressure type assembly (outdoor use): ASSE 1020
12. Vacuum breakers-atmospheric pipe applied: ANSI/ASSE 1001
13. Vacuum breakers, back siphonage, pressure type assembly (spill resistant): ANSI/ASSE 1056
14. Vacuum breakers, hose connections: ANSI/ASSE 1011
15. Vacuum breakers, laboratory faucet: ANSI/ASSE 1035
16. Vacuum breaker wall hydrants, fronts resistant automatic draining: ASSE 1019
17. Water closet flush tank fill valves (ballcocks): ASSE 1002

E. Valves Material Standards

1. Valves, bronze gate: MSS SP-80
2. Valves, cast iron gate: ASTM A 126
3. Valves, ball: MSS SP-72, MSS SP-110
4. Valves, resilient-seated gate: ANSI/AWWA C509

- F. Temperature Control Device Standards
 - 1. Individual shower control valves, anti-scald: ASSE 1016
 - 2. Temperature actuated mixing valves for primary domestic use: ASSE 1017
 - 3. Water supply valves, mixing valves and single control mixing valves: ASSE 1029
- G. Potable Water Piping
 - 1. All potable water pipes, pipe related products, and materials that join or seal pipes conform to ANSI/NSF 61.

1.7 DRAINAGE SYSTEM MATERIALS STANDARDS

- A. NonMetallic Piping
 - 1. Concrete drain tile: ASTM C 412
 - 2. Concrete perforated: ASTM C 444
 - 3. Concrete reinforced culverts: ASTM C 76, for storm drains only
 - 4. Concrete reinforced sewer pipe: ASTM C 361, for storm drains only
 - 5. Concrete sewer pipe: ASTM C 14, for storm drains only
 - 6. Sewer manholes: ASTM C 478
 - 7. Concrete (steel cylinder type): FS SS-P-381
- B. Plastic Pipe and Fittings
 - 1. Coextruded composite pipe: ASTM F 1488, See 303.8.3, 303.8.5, 704.1, 1101.5, 1103.2, 1103.4
 - 2. Coextruded composite drain, waste, and vent pipe (DWV): ASTM F 1499, See 303.8.3, 303.8.5, 704.1, 1101.5, 1103.2, 1103.4
 - 3. Coextruded PVC plastic pipe: ASTM F 891, See 303.8.3, 303.8.5, 704.1, 1101.5, 1103.2, 1103.4
 - 4. Flexible elastomeric non-pressure joints: ASTM D 3212, See 303.8
 - 5. Large diameter ribbed PVC sewer pipe and fittings: CAN/CSA-B182.4
 - 6. Polyolefin laboratory drainage systems: CAN/CSA-B181.3
 - 7. PVC-DWV pipe and fittings: ASTM D 2665, listed, See 303.8.3
 - 8. Type PS 46 and type PS 115 sewer pipe (for outside building sewers, storm drains): ASTM F 789, See 704.1, 1101.4, 1103.2, 1103.4, ASTM D 2321, installation
 - 9. Type PSM PVC sewer pipe and fittings (for outside building sewers, storm drains, and storm sewers): ASTM 3034, See 704.1, 1101.5, 1103.2, 1103.4, ASTM D 2321, installation
 - 10. Type PSP PVC sewer pipe and fittings (for outside building sewers, storm drains, and storm sewers): ASTM D 2321, Installation
 - 11. All plastic piping pipes, plastic plumbing piping components and related materials shall be listed as conforming with ANSI/NSF Standard 14.
- C. Ferrous Pipe and Fittings
 - 1. Cast iron soil pipe and fittings: ASTM A 74, CISPI HS
 - 2. CI NO-HUB pipe and fittings: ASTM A 888, CISPI Std. 301
 - 3. Ductile-iron gravity sewer pipe: ASTM A 746
 - 4. Hubless cast iron sanitary system: CISPI Std. 310
 - 5. Manhole top frames and covers: ASTM A 48

- D. NonFerrous Pipe and Fittings
 - 1. Cast copper alloy solder-joint drainage fittings: ASME B 16.23, for plumbing drainage waste and vents
 - 2. Cast copper alloy solder-joint fittings for solvent drainage systems: ANSI B 16.32
 - 3. Copper drainage tube DWV: ASTM B 306
 - 4. Welded copper and copper alloy heat exchanger tube: ASTM B 543
 - 5. Wrought copper and wrought copper alloy solder-joint drainage fittings for plumbing drainage waste and vents: ASME B 16.29
 - 6. Wrought copper and wrought copper alloy solder-joint fittings for solvent drainage systems: ANSI B 16.43
- E. Glass pipe
 - 1. Borosilicate glass pipe and fittings for DWV applications: ASTM C 1053

PART 2.00 PRODUCTS

2.1 SANITARY SEWER PIPING AND STORM SEWER - BURIED BEYOND 5 FEET OF BUILDING:

- A. Schedule 40 PVC/DWV
Fittings: Same as piping
Joints: Solvent welded

2.2 SANITARY SEWER AND STORM SEWER PIPING - BURIED WITHIN 5 FEET OF BUILDING:

- A. Schedule 40 PVC/DWV
Fittings: Same as piping
Joints: Solvent welded

2.3 SANITARY SEWER AND STORM SEWER PIPING, ABOVE GRADE:

- A. Schedule 40 PVC/DWV
Fittings: Same as piping
Joints: Solvent welded

2.4 WATER PIPING, ABOVE GRADE: Exterior water piping buried beyond 5' of building to be same as above grade.

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
Fittings: ANSI/ASME B16.18, cast bronze solder-joint pressure fittings, or ANSI/ASME B16.22, wrought copper.
- B. All potable water pipes, pipe related products and materials that join or seal pipes and pipe related products shall be evaluated and listed as conforming with a national consensus product or material standard and ANSI/NSF Standard 61.

2.5 WATER PIPING, TRAP PRIMERS: Piping for trap primer piping below slab only.

- A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

2.6 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING:

- A. Polyethylene Pipe: ASTM D2513, SDR 11.5.
Fittings: ASTM D2683 to ASTM D2513, socket type.
Joints: Fusion welded.

2.7 NATURAL GAS PIPING, ABOVE GRADE:

- A. Steel Pipe: ASTM A53 or A120, Schedule 40, black.
Fittings: ANSI/ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
Joints: Screwed for pipe two (2) inches and under; ANSI/AWS D1.1 welded, for pipe over two (2) inches. All gas piping run in a concealed space shall be welded.

2.8 FLANGES, UNION, AND COUPLINGS:

- A. Pipe Size two (2) Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, solder joints.
- B. Pipe Size Over two (2) Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service.
- C. Dielectric Connections: Unions with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.9 GATE VALVES

- A. Up to two (2) Inches: Bronze body, non-rising or rising stem and handwheel, inside screw, single double wedge or disc, solder or threaded ends. Nibco Model 113 Series, Crane Model 438 Series, Powell Model 2700, Hammond 2B 617 or approved equal.
- B. Over two (2) Inches: Iron body, bronze trim, non-rising or rising stem and handwheel, OS&Y, single wedge, flanged ends. Red and White 415/421, NIBCO F619/F617, Crane 461/465 1/2 or approved equal.

2.10 GLOBE VALVES:

- A. Up to 2 Inches: Bronze body, rising stem and handwheel inside screw, renewable composition disc, solder screwed ends, with backseating capacity. Nibco Model 211 Series, Crane Model 1 Series, Powell Model 150, Hammond 1.413, Red White 211/212 or approved equal.
- B. Over 2 Inches: Iron body, bronze trim, rising stem and handwheel, OS&Y, plug-type disc, flanged ends. Red and White Fig 400 or NIBCO F718-B, Crane 351 or approved equal.

2.11 BALL VALVES:

- A. Up to 2 Inches: Bronze or stainless steel body, stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, solder threaded ends with union. Nibco Model 580 Series, Crane Model 2330 Series, Red White 5092/5095 or approved equal.
- B. Over 2 inches: Cast steel body, chrome plated steel ball teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

2.12 BUTTERFLY VALVES:

- A. Iron body, bronze disc, resilient replaceable seat for service to 180-degrees F, or lug end butterfly, 10 position over handle or infinite position lever handle with memory stop.

2.13 SWING CHECK VALVES:

- A. Up to 2 inches: Bronze 45 degree swing disc, solder or screwed ends. Nibco Model 413 Series, Crane Model 37 Series, Red White 236/237 or approved equal.
- B. Over 2 inches: Iron body, bronze trim, 45 degrees swing disc, renewable disc and seat, flanged ends. Red White 435, Nibco F918, Crane 373 or approved equal.

2.14 SPRING LOADED CHECK VALVES:

- A. Iron body, bronze trim, spring loaded, bronze disc, wafer.
- B. Red White 442, Nibco W920W, Stockham W6-970 or approved equal.

PART 3.00 EXECUTION

3.1 PREPARATION:

- A. Ream pipe and tube ends. Remove burrs. Bevel end Ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATIONS:

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed.
- H. Slope water piping and arrange to drain at low points.
- I. Establish elevations of buried piping outside the building to insure not less than 3 feet of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- L. Establish invert elevations, slope all drainage piping 4 inches and larger to 1/8 inch per foot minimum. All drainage piping 3 inches and smaller shall be sloped to 1/4 inch per foot minimum.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide one plug cock wrench for each plug cock sized 2-1/2 inches and larger.
- P. In pipe 3 – inch nominal diameter or less, cleanouts shall be located at not more than 50ft.intervals
- Q. In pipe 4 – inches nominal diameter through 6 inches nominal diameter, cleanouts shall be located at not more than 80ft. intervals
- R. Each building drain shall be provided with a cleanout within 6ft. of the junction of the building drain and building sewer.

3.3 APPLICATION:

- A. Grooved mechanical couplings and fasteners not allowed.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe. All joints in potable lines to be lead free.
- D. Install gate, ball, butterfly valves for shut-off and to isolate equipment, part of systems, or

vertical risers.

- E. Install globe, ball, butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.

3.4 TEST

- A. Upon completion of the domestic water piping system, it shall be tested and proved tight under a water pressure not less than 200 psi. The water used for testing shall be obtained from a potable source of supply. This pressure test shall be performed before the disinfection of the domestic water piping system is started. This test shall conform to the Louisiana State Plumbing Code
- B. Upon completion of the sanitary sewer piping system the contractor shall perform a water test to prove that the system is tight and without leaks. No section of the piping system shall be tested with less than 10 ft head of water. The pressure shall be kept on the system for a time no less than 1 hour. This test shall conform to the Louisiana State Plumbing Code.
- C. Upon completion of the sanitary vent piping system the contractor shall perform a pressure test to prove that the system is tight and without leaks. This test shall conform to the Louisiana State Plumbing Code.
- D. All Gas piping shall be tested in accordance to NFPA 54.
- E. Prior to any test, the contractor shall notify the Architect in writing a minimum of 5 business days, the date and time the test will take place. No exceptions. After the completion of the test but before the building is substantially complete the contractor shall submit a written report with the following information for each test performed.
 - 1. Project Name
 - 2. Project Location
 - 3. Plumbing Contractor Name, Address and Contact Information
 - 4. Identification of test performed.
 - 5. Time and Date test was started
 - 6. Time and Date test was completed.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM:

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Option 1: The system shall be filled with a solution containing 50 ppm of available chlorine and allowed to stand 6 hours before flushing and returning to service.
- C. Option 2: The system shall be filled with a solution containing 100 ppm of available chlorine and allowed to stand 2 hours before flushing and returning to service.
- D. Prior to the disinfection of the domestic water piping system the contractor shall inform the

architect in writing the date and time the disinfection will take place. After the completion of the disinfection of the domestic water piping system but before the building is substantially completed the contractor shall submit a written report with the following information.

1. Project Name
2. Project Location
3. Plumbing Contractors Name, Address, and contact information
4. Chemicals used in the disinfection process.
5. Time and Date disinfection process was started
6. Time and Date disinfection process was completed

3.6 SERVICE CONNECTIONS:

- A. Provide new sanitary and storm sewer services and tie into existing as shown on plans. Before commencing work check invert elevations required for sewer connections, confirm inverts and insure that these can be properly connected with slope for drainage and cover to avoid freezing. Contractor to tie in existing services as shown on drawings.
- B. Tie domestic water into existing services as shown on drawings. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Provide 18-gauge galvanized sheet metal sleeve around service main to 6 inches above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing. Contractor shall utilize and tie in existing water lines as indicated on the drawings.
- C. Tie new gas service into existing onsite. Coordinate connection with gas service provider.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15430 - PLUMBING SPECIALTIES

PART 1.00 GENERAL

1.1 WORK INCLUDED

- A. Floor drains
- B. Trap Primers
- C. Roof Drains
- D. Cleanouts
- E. Backflow preventors
- F. Water hammer arrestors
- G. Hose bibbs hydrants

1.2 RELATED WORK

- A. Section 15140 - Supports and Anchors
- B. Section 15410 - Plumbing Piping
- C. Section 15440 - Plumbing Fixtures

1.3 REFERENCES

- A. ANSI/ASSE 1012 - Backflow Preventers with immediate Atmospheric Cent.
- B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
- C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- E. ANSI A112.21.1 - Roof Drains
- F. ANSI A112.26.1 - Water Hammer Arrestors
- G. PDI WH-201 Water Hammer Arrestors

1.4 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Include component sizes, rough-in requirements, service sizes, and finishes.

PART 2.00 PRODUCTS

2.1 FLOOR DRAINS

- A. Floor Drain (FD): ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, square adjustable nickel- bronze strainer, and trap primer connection; Wade model 1100G, Zurn model Z415s or Smith model 2005.
- B. All floor drains installed shall have trap primers.

2.2 TRAP PRIMERS

- A. Trap primers shall be PPP, Inc. Prime-Rite 500 with AG-500 air gap fitting. Distribution unit may be used for multiple floor drains. Trap primers shall be installed as per manufacturer recommendations and in strict accordance with the Louisiana Plumbing Code. Proper air gap shall be maintained between the trap primer and the domestic water supply. Elastomeric flexible type trap guards will not be allowed on this project.

2.3 ROOF DRAINS

- A. Roof Drains (RD): Duco Cast Iron body with adjustable extension sleeve, reversible collar, combined flashing clamp, under deck clamp, and gravel stop, with cast iron dome. Coordinate outlet with storm sewer piping. Wade model 3000-ADF, Zurn model Z100, or Smith model 1015.

2.4 EMERGENCY ROOF DRAIN

- A. Emergency roof drain (ERD): Duco cast iron body with adjustable extension sleeve, 2" high combination membrane flashing clamp/gravel guard with cast iron dome drain. Coordinate outlet size with storm sewer piping. Zurn Z-100, Wade, or Smith.

2.5 FLOOR SINK

- A. Floor sink (FS): 12"x12" floor sink with square nickel bronze top, 8" deep, aluminum dome strainer. Zurn Z1901, Wade 9144, or Smith 300.

2.6 CLEANOUTS

- A. Exterior Surfaced Areas: As detailed on Plans.
- B. Interior Finished Floor Areas: Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel- bronze strainer, square with scoriated cover in service areas and square with depressed cover to accept floor finish in finished floor areas; Model W-6000 manufactured by Wade or Model ZN-1400 manufactured by Zurn or 4000 Series manufactured by Smith.
- C. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketted cover, and round stainless steel access cover secured with machine screw; Model W-8460-R manufactured by Wade or Model ZN-1445-1 manufactured by Zurn or Model 4532 manufactured by Smith.
- D. Interior Unfinished Accessible Areas: Caulked or threaded type, provide bolted stack cleanouts on vertical rainwater leaders.
- E. Acceptable Manufacturers
 - 1. Wade 6000
 - 2. Zurn 1400
 - 3. Substitutions: Under provisions of Instructions To Bidders.

2.7 BACKFLOW PREVENTERS FOR DOMESTICE WATER

- A. Pressure Backflow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and Stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.
- B. Acceptable Manufacturers
 - 1. Watts Model 909
 - 2. Wilkins Model 375
 - 3. Substitutions: Under provisions of Instructions To Bidders.

2.8 REDUCED-PRESSURE-DETECTOR, FIRE-PROTECTION, BACKFLOW-PREVENTER ASSEMBLIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Ames Fire & Waterworks; a Watts Water Technologies Company
 - 2. FEBCO; a Watts Water Technologies Company
 - 3. Watts Regulator; a Watts Water Technologies Company
 - 4. Substitutions: Under provisions of Instructions To Bidders
- B. Standard: ASSE 1047 and is FM Global approved or UL listed.
- C. Operation: Continuous-pressure applications.

- D. Pressure Loss: 12 psig maximum, through middle third of flow range.
- E. Body: Cast iron with interior lining that complies with AWWA C550 or that is FDA approved.
- F. End Connections: Flanged.
- G. Configuration: Designed for vertical-inlet, horizontal-center-section, and vertical-outlet flow.
- H. Accessories:
 - 1. Valves: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - 2. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
 - 3. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

2.9 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range - 100 to 300 degrees F (-73 to 49 Degrees C) and maximum 250 psig (1700 kpa) working pressure.
- B. Acceptable Manufactures
 - 1. Wade Model W-5, W-10, W-20
 - 2. Zurn Model Z-1700-100, 200, 300
 - 3. Smith Model 5000
 - 4. Substitutions: Under provisions of Instructions To Bidders.

PART 3.00 EXECUTION

3.1 PREPARATION

- A. Coordinate cutting forming of roof floor construction to receive drains to required invert elevations.

3.2 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Insure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.

- D. Install water hammer arrestors complete with accessible isolation valve.
- E. In pipe 3 – inch nominal diameter or less, cleanouts shall be located at not more than 50ft.intervals
- F. In pipe 4 – inches nominal diameter through 6 inches nominal diameter, cleanouts shall be located at not more than 80ft. intervals
- G. Each building drain shall be provided with a cleanout within 6ft. of the junction of the building drain and building sewer.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15440 - PLUMBING FIXTURES AND TRIM

PART 1.00 GENERAL

1.1 SECTION INCLUDES

- A. Plumbing Fixtures and Trim

1.2 RELATED WORK

- A. Section 15000 - General Mechanical
- B. Section 15410 - Plumbing Piping
- C. Section 15430 - Plumbing Specialties

1.3 SUBMITTALS

- A. Furnish and install plumbing fixtures as shown on the accompanying drawing and in accordance with the approved rough-in drawings. This will include service sinks, lavatories, water closets, urinals, etc., with all brass in connection with supply tubing, traps, escutcheons, stop and basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated and in perfect condition.
- B. All brass must be best quality. All brass pipe to be seamless brass tubing and all fixture traps shall be heavy with C.O. plugs. Nipples shall be extra heavy. Lightweight goods will not be accepted. All exposed metal on fixtures shall be C.P. or Chromard. All "P" traps shall be complete with cleanout plug.
- C. Contractor shall submit in his fixture brochure for approval, a rough-in sheet of each fixture and indicate any variation required for the fixtures. Fixtures are to be roughed-in in accordance with these approved rough-in sheets and anchored so that piping cannot be moved.

1.4 JOB CONDITIONS

- A. Check millwork shop drawings. Conform location and size of fixtures and openings before rough-in and installation.

PART 2.00 PRODUCTS – see plans

PART 3.00 EXECUTION

3.1 INSTALLATION

- A. Install furnish and install all plumbing fixtures and accessories according to manufacturer's instruction and according to national, state and local codes governing the various systems.

Carefully review the Architectural floor plans and millwork details to determine exact number of all fixtures, outlets, accessories required and exact mounting height. Contractor shall verify any and all electrical requirements prior to ordering equipment. Coordinate all fixtures, outlets, drains, accessories, etc., prior to submitting shop drawings.

- B. Install each fixture in accordance with rough-in drawings as per manufacturers recommendations. At completion thoroughly clean plumbing fixtures and equipment. Anchor fixtures rigidly; anchor piping in walls so that piping cannot be moved.
- C. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers and escutcheons.
- D. Solidly attach floor water closets to floor with lag screws and finishing caps.
- E. Install each fixture with trap, easily removable for servicing and cleaning.
- F. All fixtures supplied with domestic water, hot or cold, shall be installed with integral stops on all supply lines.
- G. Mount fixtures to the following heights above finished floor:
 - 1. Water Closets:
 - a. Standard 15" to top of bowl rim
 - b. Handicapped 18" to top of seat
 - 2. Urinal:
 - a. Standard 22" to top of bowl rim
 - 3. Lavatories:
 - a. Handicapped 34" to top of basin rim
 - 4. Water Closet Flush Valves:
 - a. Standard 11" min. above bowl rim
- H. Contractor shall caulk all joints at walls and floors with plumbing fixtures.
- I. Contractor shall provide approved ADA drain and water line insulation covers on all exposed services for lavatories and sinks. Truebro Lav Guard or approved equal.

3.2 FIXTURE ROUGH-IN SCHEDULE:

- A. Rough-in fixture piping and size connections shall be in accordance with the following table of minimum sizes for particular fixtures unless noted different on the drawing:

PLUMBING FIXTURE ROUGH-IN SCHEDULE

=====				
<u>DESCRIPTION</u>	<u>C.W.</u>	<u>H.W.</u>	<u>WASTE</u>	<u>VENT</u>

WATER CLOSET (TANK)	1/2"	—	4"	3"
WATER CLOSET (FLUSH VALVE)	1"	--	4"	3"
URINAL (FLUSH VALVE)	3/4"	--	2"	1-1/2"
LAVATORY	1/2"	--	2"	1-1/2"
SERVICE SINK	1/2"	1/2"	3"	2"
ELECTRIC WATER COOLER	1/2"	--	2"	1-1/2"
SINK	1/2"	1/2"	2"	1-1/2"
HOSE BIBB	3/4"	--	--	--
2" FLOOR DRAIN	--	--	2"	1-1/2"
3" FLOOR DRAIN	--	--	3"	2"
3" HUB DRAIN	--	--	3"	2"

WATER PIPE SIZING TABLE

UNLESS SHOWN OTHERWISE, DOMESTIC WATER LINES SHALL RUN CONCEALED OVERHEAD AS DESIGNATED IN PLUMBING FIXTURE SCHEDULE AND BE SIZED ACCORDING TO TABLE BELOW.

PLANS AND RISER DIAGRAMS DO NOT NECESSARILY SHOW ALL PIPING RUNS. INSTALL A FACTORY SHOCK ABSORBER AT TOP OF EACH FIXTURE GROUP AND ALSO AT WATER HEATERS.

<u>NUMBER OF FIXTURES*</u>	<u>PIPE SIZE (IPS)</u>
2 OR LESS	1/2"
3 TO 5	3/4"
6 TO 10	1"
11 TO 15	1-1/4"
16 TO 28	1-1/2"

*FLUSH VALVE WATER CLOSET IS EQUIVALENT TO SIX (6) FIXTURES SIZES INDICATED ABOVE ARE MINIMUM SIZES TO BE USED UNLESS OTHERWISE STATED

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15624 - FORCED AIR FURNACE - ELECTRIC HEAT - DX

PART 1.00 GENERAL

1.01 WORK INCLUDED

- A. Forced Air Furnace
- B. Refrigeration Cooling Coil
- C. Controls
- D. Electric Heater

1.02 RELATED WORK

- A. General Mechanical
- B. Supports and Anchors
- C. Piping Insulation
- D. Air Cooled Condensing Unit
- E. Ductwork

1.03 QUALITY ASSURANCE

- A. Conform to requirements of UL and applicable codes.
- B. Cooling system tested and rated to ARI Standard 210.

1.04 SUBMITTALS

- A. Submit manufacturer's installation instructions.
- B. Submit manufacturer's descriptive literature, operating instruction, and maintenance and repair data.

PART 2.00 PRODUCTS

2.01 TYPE

- A. Provide horizontal type with electric heating elements.
- B. Provide self contained packaged, factory assembled, pre-wired units, consisting of cabinets, supply fan, controls, air filter, refrigerant cooling coil.

2.02 PERFORMANCE

- A. Refer to Schedule of Drawings for performance and capacities.

2.03 CONSTRUCTION

- A. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation.
- B. Fan: Direct or belt drive (as scheduled), rubber isolated mounted 1750 rpm motor.
- C. Air Filters: One (1) inch thick glass fiber, disposable type arranged for easy replacement.

2.04 ELECTRIC HEATER

- A. Finned tube metal sheath heating elements or open coil type (black heat) arranged in incremental stages as scheduled, accessible, with protection against no or low air flows, shorts or grounds, and failure of protection devices.

2.05 ELECTRIC HEATER CONTROLS

- A. Unit to be complete with low voltage transformer, terminal box with built-in factory wired magnetic contactors and high temperature thermal cutout protection with magnetic contactors rated for 100,000 cycle service: electric heating coils to be protected as per Article 424 of National Electric Code, UL approved and so labeled.

2.06 EVAPORATOR COIL

- A. Mount in furnace supply plenum, copper tube with mechanically bonded aluminum fins in a coil assembly, with galvanized drain pan, drain connection, and refrigerant piping connections.
- B. Provide factory installed thermostatic expansion valve.

2.07 CONTROLS

- A. Temperature control sequence of air conditioning equipment: "Automatic controls are placed into operation when system is energized. Provide room type thermostat to cycle condensing unit on the cooling cycle and the electric heater strip on the heating cycle as required to maintain space conditions. Air handling unit fan shall be wired for constant fan operation and shall be electrically interlocked such that the condensing unit may not run nor the electric heater strip be energized unless the evaporator fan is running. An air switch shall be installed which shall prevent electric heater operation until air flow is proven. If return air temperature rises above firestat setpoint then the firestat (located in the return air plenum) shall de-energize the air handling unit fan(s). If supply air contains smoke, a smoke detector (located in the supply air plenum) shall de-energize the air handling unit fan(s). If auxiliary drain pan fills with water, a float switch shall de-energize the condensing unit."

- B. Contractor shall provide clear locking cover for all thermostats.

2.08 ACCEPTABLE MANUFACTURERS

- A. TRANE COMPANY
- B. YORK INTERNATIONAL
- C. LENNOX INDUSTRIES

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. Install in strict accordance with manufacturer's recommendations.
- B. Pipe condensate drain as shown on the drawings or to the nearest available plumbing vent.

END OF SECTION

DIVISION 15 – MECHANICAL
SECTION 15671 - AIR COOLED CONDENSING UNIT

PART 1.00 GENERAL

1.1 WORK INCLUDED

- A. Condensing Unit Package
- B. Internal Piping and Accessories
- C. Controls

1.2 RELATED WORK

- A. Section 15000: General Mechanical
- B. Section 15140: Supports and Anchors
- C. Section 15170: Motors
- D. Section 15190: Mechanical Identification
- E. Section 15623: Forced Air Furnace - Electric - DX

1.3 QUALITY ASSURANCE

- A. Conform to requirements of UL and applicable codes.
- B. Test and rate cooling system to ARI Standard 210.

1.4 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Submit with shop drawings, schematic layouts showing condensing units, cooling coils, refrigerant piping, size, and accessories required for complete system.
- C. Submit manufacturer's installation instructions.

PART 2.00 PRODUCTS

2.1 TYPE AND PERFORMANCE

- A. Provide self-contained, package, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressor(s), condensing coil(s) and fan(s), integral sub-cooling coil, controls, liquid receiver, and screen(s).
- B. All Condensing Unit's to be supplied with coil guards.
- C. Refer to Schedule on Drawings for air cooled condensing unit(s) requirements.
- D. Acceptable Manufacturer: TRANE COMPANY; YORK INTERNATIONAL; LENNOX

INDUSTRIES

2.2 MATERIALS

- A. Use corrosion resistant materials for parts in contact with refrigerant. Provide timer circuits to prevent rapid loading and unloading of compressor.

2.3 CABINET

- A. Galvanized steel with baked enamel finish, and removable access doors or panels with quick fasteners.

2.4 COMPRESSOR(S)

- A. Provide hermetically sealed, 1750 rpm resiliently mounted compressor with positive lubrication, crankcase heater, cylinder unloaders for capacity modulation (as scheduled), motor overload protection, service valves, filter driers (suction and liquid), and sight glass.

2.5 CONDENSER

- A. Coil: Seamless copper tube with mechanically bonded aluminum fins.
- B. Fans: Vertical discharge, direct or belt drive axial fan(s), resiliently mounted with guard and motor.
- C. Motors: Permanently lubricated ball bearing motors with built-in current and overload protection.

2.6 CONTROLS

- A. Provide high and low pressure cutouts for compressor, oil pressure control, and reset relay.
- B. Provide controls to permit operation down to 50-degrees F. ambient temperature at minimum compressor load.
- C. Provide programmable Digital Thermostats.

2.7 REFRIGERANT PIPING

- A. Refrigerant piping shall be run in Type "L" hard drawn copper tubing attached with wrought copper fittings, utilizing 1000-degree silver solder and a non-corrosive flux. Refrigerant piping shall be sized and installed in strict accordance with the air conditioning unit manufacturer's recommendations and directions and shall be submitted to the Engineer for prior approval before installation. Pressure drops shall not exceed the equivalent of 2-psi. Refrigerant piping system shall be evacuated, charged with refrigerant holding charge. The refrigerant lines to be tested with nitrogen to a test pressure of not less than 450 psi and proved before final charge of refrigerant. Compressor shall not be subject to the 450 psi pressure test.
- B. All refrigerant piping shall comply with the applicable requirements of the safety Code of Mechanical Refrigeration (ASA-89.1-1956) and the Code of Refrigerant Piping (ASA-

831.5-1962), and all state ordinances, codes, and regulations.

- C. Refrigerant suction line shall be insulated with cellular foam type insulation; "K" value of 0.28 at 75-degrees F. Manufacturers: Armstrong "Armaflex" or Rubatex R-180-FS.

PART 3.00 EXECUTION

3.1 INSTALLATION

- A. Complete structural, mechanical and electrical connections in accordance with manufacturer's installation instructions.
- B. Mount unit on 4" concrete pad with minimum 6" clearance all around or as indicated on the drawings.
- C. Furnish charge of refrigerant and oil.

3.2 START-UP AND TESTING

- A. Dehydrate, charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

3.3 GUARANTEE

- A. Reciprocating refrigerant compressor shall have full five (5) year warranty.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15890 - DUCTWORK

PART 1.00 GENERAL

1.01 WORK INCLUDED

- A. Low pressure duct.
- B. Fire and Smoke Dampers

1.02 RELATED WORK

- A. Section 15140 - Supports and Anchors
- B. Section 15260 - Piping and Equipment Insulation
- C. Section 15930 - Air Terminal Units
- D. Section 15936 - Air Inlets and Outlets
- E. Section 15954 - Testing and Balance

1.03 REFERENCES

- A. ASHRAE, 2009 Fundamentals, Chapter 21.
- B. ASHRAE, 2008 Equipment, Chapter 18.
- C. NFPA 90A, 90B.
- D. H.V.A.C. Duct Construction Standards - SMACNA 1995.

1.04 DEFINITIONS

- A. Duct sizes: All duct sizes are indicated on the plans as metal to metal.
- B. Low Pressure: Three pressure classifications: 1/2" WG positive or negative static pressure and velocities less than 2,000 fpm, 1" WG positive or negative static pressure and velocities less than 2,500 fpm and 2" WG positive or negative static pressure.
- C. Medium Pressure: Three pressure classifications: 3 inch WG positive or negative static pressure and velocities less than 4,000 fpm, 4" WG positive static pressure and velocities greater than 2,000 fpm. 6" WG positive static pressure and velocities greater than 2,000 fpm.

1.05 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and NFPA 90B Standards.

- B. Store and protect products under provisions of Section 01600.
- C. Construct ductwork to International Mechanical Code Standards

PART 2.00 PRODUCTS

2.01 LOW PRESSURE DUCTWORK

- A. Furnish and install all ducts for the air conditioning, heating and ventilating systems. Ductwork shall be complete with grilles, vanes splitters, flashings, hangers, flexible connections, manual dampers, fresh air inlet louvers, reinforcing angles, transitions to equipment, etc.
- B. All low pressure ductwork (mean velocity less than 2,000 FPM and static pressure in duct 2" of water or less) shall be constructed as per SMACNA Standards, 1995 Edition, Chapter 1, and shall be of the gauge metal and reinforced as per SMACNA Standards, 1995 Edition.
- C. Flashing shall be of the same material as specified under the roofing and flashing section of these specifications, or of 16-ounce sheet copper and shall be furnished and installed around all outside openings used for ducts or fans where required. Roof flashing shall extend at least 8" above roof. Cooperate with roofing contractor when installing flashing.
- D. All duct connections to equipment shall be made with fire and mildew resistant flexible connections of canvas or other acceptable materials. Connections shall have suitable metal collar frames at each end and shall not be less than 4" long with at least 1" of slack in the connection. Flexible connections shall be heat resistant to 500 degrees F continuously.
- E. Duct dimensions shown are metal sizes. All edges shall be straight and true.
- F. All flexible connections, duct liner and adhesives shall be U.L. listed as having a maximum flame spread of 50, fuel contribution of 25 and smoke contribution of 25.
- G. This Contractor shall furnish and install in ductwork all dampers, vanes splitters, etc.. as shown on the drawings or necessary to make the system complete. Where dampers or splitters can not be accessed through lay in ceiling, Contractor shall provide lockable 24" x 24" access door. Contractor shall coordinate location with Architect.
- H. Shafts shall be marked to show position of dampers, vanes, splitters, etc.
- I. Ductwork shall be supported in accordance with SMACNA Plate No. 17 and No. 18, up to and including band iron hangers attached to duct by means of screws or rivets per hanger.
- J. Access doors shall be provided in ductwork for all automatic dampers and each manual damper 3 square feet in area or larger, and shall be so located that damper can be completely serviced through the access door. Access door shall be provided with felt gaskets and suitable hinges and locks. Where access doors occur in insulated duct, double skin insulated doors shall be used.
- K. Where square ducts are shown, provide single vane elbows as per Plate 22, Figure A, SMACNA Standards, 1995 Edition. For all ductwork over 18" provide double vane square elbow as shown in Figure C of the Plate.

- L. All low pressure ductwork joints shall be sealed with hard cast "iron grip".
- M. Flexible air duct for connections between low pressure rectangular duct and ceiling diffusers shall be pre- insulated and listed by Underwriters Laboratories under U.L Standard 181 as a Class 1 flexible air duct and complying with NFPA Standards 90A and 90B.
- N. All flex duct 45 degree and 90 degree turns shall be metal hard duct.

2.02 INSULATED ACOUSTICAL LOW PRESSURE FLEXIBLE DUCT

- A. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel.
- B. Provide where indicated on drawings Flexmaster Type 8M UL181 Class I Air Duct.
- C. Fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.
- D. The internal working pressure rating shall be at least 6" w.g. positive and 4" w.g. negative with a bursting pressure of at least 2½ time the working pressure.
- E. The duct shall be rated for a velocity of at least 4000 feet per minute.
- F. The duct must be suitable for continuous operation at a temperature range of -20° F to +250°
- G. Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council's Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM 477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	7	31	40	38	40	27
8" diameter	13	29	36	35	38	22
12" diameter	21	28	29	33	26	12

The radiated noise reduction (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	5	8	7	8	11	15

8" diameter	10	7	7	8	10	13
12" diameter	9	6	6	5	9	13

The self generated sound power levels (LW) dB re 10^{-12} Watt of a 10 foot length of straight duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	42	31	23	18	17	21
8" diameter	41	34	27	19	18	21
12" diameter	54	45	38	31	27	23

Factory insulate the flexible duct with fiberglass insulation. The R value shall be at least 5.0 at a mean temperature of 75° F. (R-4.2 is not acceptable)

H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96, Procedure A.

J. Maximum length to be 6'-0

ALL FLEX CONNECTIONS TO CEILING DIFFUSERS MUST BE FACTORY DESIGNED TO HAVE NO DIMENSIONAL CONTORTION WHEN CONNECTED TO THE DIFFUSER. A HARD METAL 90-DEGREE ELBOW OR A PLASTIC "CRUTCH" ELBOW IS REQUIRED FOR OTHER FLEX DUCTS THAT MAY BE SUPPLIED

2.03 FIRE AND SMOKE DAMPERS

A. Round and oval fire dampers shall be designed for high pressure duct systems.

B. Rectangular fire dampers shall be designed for low pressure duct systems.

C. All fire dampers must be NFPA 90A and UL approved.

D. Furnish and install access doors in ductwork, walls, and ceilings where required to service all fire dampers, smoke dampers and detectors. All fire and smoke dampers shall be installed by the sheet metal contractor. All smoke detectors shall be furnished by the electrical Sub-contractor. Control of smoke dampers shall be coordinated with fire alarm system and building automation system.

E. Rectangular Smoke Dampers - Louvers Dampers Inc. Model SD-400-UD or Ruskin FSD-35 tight seal parallel blade smoke dampers with low leakage and felted blades.

F. Round and Oval Smoke Dampers - Shall be same as above but complete with welded round or oval collars. Units shall be capable of handling pressures up to 6" W.G.

- G. Smoke dampers shall be Class I rated as per UL 555.
- H. Sheet metal contractor shall provide and install all smoke dampers and actuators. Dampers shall be provided with end switches
- I. Approved Manufacturers: Pottorff, Ruskin, Price, Nailor Industries, Greenheck, or prior approved equal.

2.04 LOW LOSS TAP

- A. All round low pressure connections to rectangular ducts shall be made with a factory fabricated 45 degree low loss entry "shoe" tap with damper constructed of minimum 26 gage galvanized steel. The damper shall have a 2" raised handle with a high quality locking quadrant. A 3/8" continuous rod with "U" bolts connects the damper to the rod. Nylon end bearings are required where the rod penetrates the spin collar barrel.
- B. Provide Flexmaster #STOD-BO3, Dace # 26 ga STOD-C03, or prior approved equal.
- C. For medium pressure systems where used upstream of VAV terminals, the damper can be eliminated (use Flexmaster #STO or Dace 24 ga STO). Gauge shall be 24 gauge on medium pressure systems.

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. See details of ductwork symbols and connections on drawing.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15936 - AIR OUTLETS AND INLETS

PART 1.00 GENERAL

1.01 WORK INCLUDED

- A. Diffuser boots.
- B. Registers/grilles.
- C. Louvers.

1.02 RELATED WORK

- A. See Mechanical Plans for wall louvers.

1.03 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. AMCA 500 - Test Method for Louvers, Dampers, and Shutters.
- C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- D. ARI 650 - Air Outlets and Inlets.
- E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- F. SMACNA - Low Pressure Duct Construction Standard.

1.04 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.05 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Provide product data for items required for this project.
- C. Submit schedule of outlets and inlets indicating type, size, application, and noise level.

- D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.
- E. Submit diffuser, grille and register color data to Architect for approval.

PART 2.00 PRODUCTS

2.01 GENERAL

- A. See mechanical schedules and drawings for diffuser types, sizes and configuration. See architectural plans - room finish schedules for type of ceiling and wall construction.
- B. Substitutions: Under provisions of Instructions To Bidders, Page IB-3, Paragraph 4.3.

2.02 ACCEPTABLE MANUFACTURERS - Ceiling Diffusers

- A. Titus TMSA Series, Krueger Series 1400 Adjustable
- B. All diffusers shall have opposed blade volume dampers and adjustable horizontal to vertical four way throw operable from face of grille. All diffusers must be aluminum.

2.03 ACCEPTABLE MANUFACTURERS - Ceiling Exhaust Grilles

- A. Titus - Model 50F Code C 1/2" x 1/2" x 1" Cube Core, Krueger EGC-10, Nailor Industries Model 51EC
- B. All exhaust registers shall have opposed blade dampers.
- C. Grilles shall have baked enamel white finish.
- D. All dampers shall be operable from grille face.

2.04 ACCEPTABLE MANUFACTURERS - Ceiling Return Air Grilles

- A. Titus - 50F Code C, Krueger EGC-10, Nailor Industries
- B. All return air shall have opposed blade dampers. See plans for filter backed grille requirements.

2.05 ACCEPTABLE MANUFACTURERS - Wall Supply Registers.

- A. Titus 1700 Series, Krueger ULTRA-FLO
- B. All registers shall have adjustable blade dampers on all registers.
- C. Furnish and install opposed blade damper on all registers.
- D. Finish to be approved by Architect.

2.06 ACCEPTABLE MANUFACTURERS - DOOR RETURN GRILLES

- A. Titus Model CT-700, Krueger Series 5600, Nailor Industries
- B. Substitutions: Under provisions of Instructions To Bidders.
- C. All aluminum construction & design.
- D. Finish to be approved by Architect.

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. Install items in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Refer to Section 09900.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and register, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Furnish and install necessary frames, bucks, sponge rubber gasketed, etc. to make a neat setting job.
- F. Diffusers shall be placed to insure that air does not blast against columns and lights.
- G. All diffusers, registers, etc. shall have external volume controls and deflecting grids.
- H. Ceilings in areas where plaster or gypsum board ceiling are used, shall be surface mounted.

END OF SECTION

DIVISION 15 - MECHANICAL
SECTION 15954 - TESTING, ADJUSTING, AND BALANCING

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

- A. All division 15 specification sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

1.02 SCOPE OF WORK

- A. The Contractor shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s).
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.
- C. Representatives of the Test and Balance Company shall visit the job site during installation of the HVAC equipment, piping and ductwork as required.
- D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.
- E. The test and balance report complete with a summary page listing all deficiencies shall be submitted to the Architect for review by his Mechanical Engineer. If the Mechanical Engineer agrees with the report, he shall sign it and return it to the Architect. The test and balance report must be complete and must be accepted by the Mechanical Engineer prior to acceptance of the project. Any outstanding test and balance items shall be placed on the punch list and a monetary value shall be assigned to them.
- F. After all deficiencies have been corrected the Mechanical Engineer shall sign the testing and balancing report, and the Test and Balance Company shall supply four (4) copies of the final and complete report to the Architect for inclusion in the Operation and Maintenance Manuals.
- G. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:

AIR SYSTEMS

Supply Fans

Zone, Branch, & Main Ducts

Diffusers, registers, & grilles

Coils

1.03 DEFINITIONS, REFERENCES, STANDARDS

- A. All work shall be in accordance with the latest edition of the Associated Air Balance Council (AABC) National Standards or the latest standards of the National Environmental Balancing Bureau (NEBB). If these contract documents set forth more stringent requirements than the AABC National Standards or the NEBB Standards, these contract documents shall prevail.

1.04 QUALIFICATIONS

- A. Agency Qualifications: The TAB Agency shall be a current member of the AABC or the NEBB and must be in good standing with FP&C. A list of these firms shall be obtained from FP&C. Falsification of a TAB report shall be grounds for removal from the FP&C list and the firm's actions shall be reported to the appropriate certification agency. The contractor may use any FP&C approved TAB firm on a state project.

1.05 SUBMITTALS

- A. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.
- B. Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards or the NEBB Standards.

1.06 TAB PREPARATION AND COORDINATION

- A. Shop drawings, submittal data, up-to-date revisions, change orders, fan curves, pump curves and other data required for planning, preparation, and execution of the TAB work shall be provided when available and no later than 30 days after the Designer has returned the final approved submittal data to the Contractor.
- B. System installation and equipment startup shall be complete prior to the TAB agency's being notified to begin.
- C. The building control system (BCS) contractor shall provide and install the control system, including all temperature, pressure and humidity sensors. These shall be calibrated for accurate control. If applicable, the BCS contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.
- D. All test points, balancing devices, identification tags, etc., shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- E. Qualified installation or startup personnel shall be readily available for the operation and adjustment

of the systems. Assistance shall be provided as required for coordination and problem resolution.

1.07 REPORTS

- A. Final TAB Report - The TAB agency shall submit the final TAB report for review by the Architect. On plans provided, all outlets, devices, HVAC equipment, etc., shall be identified (including manufacturer, model number, serial number, motor manufacturer, HP, drive type, fan and motor sheaves and belt number), along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" (or similar NEBB Guaranty) assuring that the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards (or similar NEBB Standards). The Designer shall certify his approval on the Performance Guaranty.
- B. Submit 4 copies of the Final TAB Report to the Architect for inclusion in the Operation and Maintenance Manuals.

PART 2.00 INSTRUMENTATION

- A. All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards (or similar NEBB Standards).

PART 3.00 EXECUTION

3.01 GENERAL

- A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards (or similar NEBB Standards). Adjustment tolerances shall be + or - 10% unless otherwise stated.
- B. Equipment settings, including manual damper quadrant positions, valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.
- C. All information necessary to complete a proper TAB project and report shall be per AABC or NEBB standards unless otherwise noted. The descriptions of work required, as listed in this section, are a guide to the minimum information needed.
- D. TAB contractor shall cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. Upon completion, patch insulation, ductwork and housings using materials identical to those removed. Seal insulation to reestablish integrity of the vapor barrier.
- E. TAB work shall include additional inspection and adjustment of components during the season following the initial balance to include re-balance of any items influenced by seasonal changes or as directed by the Owner.

3.02 AIR SYSTEMS

- A. The TAB agency shall verify that all ductwork, splitters, extractors, dampers, grilles, registers, and diffusers have been installed per design, are functional and set full open. Any leakage in the ductwork shall be repaired prior to the test. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards or NEBB Standards:

For supply fans:

1. Fan speeds - Test and adjust fan RPM to achieve design CFM requirements.
2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
4. Outside Air - Test and adjust the outside air on applicable equipment using a Pitot-tube traverse. If a traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet. If a traverse is not practical use the mixed-air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between Pitot-tube traverses of the supply and return air ducts.
5. Static Pressure - Test and record system static pressure, including the static pressure profile of each supply fan.

For exhaust fans:

1. Fan speeds - test and adjust fan RPM to achieve design CFM requirements.
2. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure motor is not in or above the service factor.
3. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main exhaust ducts to obtain total CFM. If a Pitot-tube traverse is not practical, an explanation of why a traverse was not made must appear on the appropriate data sheet.
4. Static Pressure - Test and record system static pressure, including the static pressure profile of each exhaust fan.

For zone, branch and main ducts:

1. Adjust ducts to within design CFM requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

For diffusers, registers and grilles:

1. Tolerances - Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts. Include required CFM, initial test CFM and final CFM.
2. Identification - Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

For coils:

1. Air Temperature - Once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.

3.03 ADDITIONAL TAB SERVICES

- A. Job Site Inspections: During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems as required.
- B. Verification of HVAC Controls: The TAB agency shall be assisted by the building control systems Contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:
 - 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.
 - 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
- C. Temperature Testing: To verify system control and operation, a series of three temperature tests shall be taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.
- D. TAB Report Verification: At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.

END OF SECTION

DIVISION 16 – ELECTRICAL
SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1.00 GENERAL

1.01 SCOPE

- A. The scope of work is as indicated on electrical drawings and includes but is not limited to the following:
- B. Site:
 - 1. Coordination with the local utility company and provide conduits with pull boxes to utility tie-in point, per utility co. specifications. Provide secondary conduit, metering equipment, service termination, and junction box with splicing hardware. Include all Utility Company fees for service connection in bid.
 - 2. Coordinate communication services with the local telecommunication company and provide service conduit with pull rope to locations stipulated by Utility Company.
 - 3. Provide a natural gas emergency generator, automatic transfer switch, and associated emergency power feeders.
 - 4. Provide temporary construction power; coordinate with the local Utility Company.
 - 5. Provide in-ground pull boxes and conduit as requires to serve any/all electrical equipment located throughout the site.
 - 6. Provide site lighting poles and associated branch circuits.
- D. Power:
 - 1. Provide panel, safety disconnect switches and associated feeder(s).
 - 2. Provide receptacles, special outlets, junction boxes, and their associated branch circuits.
 - 3. Provide branch circuits associated with all mechanical and plumbing system equipment, including all accessories such as motorized dampers, valves, fan interlocks, ionization, etc.
- E. Lighting:
 - 1. Provide interior light fixtures, wall switches, wall dimmers, and occupancy sensors and associated branch circuits.
 - 2. Install all lighting fixtures furnished by others and associated branch circuits.
 - 3. Provide all exterior building mounted fixture and associated branch circuits.
 - 4. Provide exit light fixtures and both interior and exterior emergency light fixtures.
- F. Telecommunications:
 - 1. Provide junction boxes and conduit for phone and data outlets. All wiring and equipment by others shown unless otherwise indicated.
 - 2. Provide 3/4" plywood backboard. Paint with two coats of fire retardant paint on both sides.
- G. Fire Alarm:
 - 1. Provide fire alarm control panel, voice evacuation panel and remote booster panels.
 - 2. Provide manual pull stations at all exterior exits.
 - 3. Provide visual and audio notification throughout including voice evacuation.
 - 4. Provide smoke detectors at all control panels, voice evacuation panels and booster panels.

5. Provide duct mounted smoke detectors for all air units with greater than 2000 cfm air flow.
6. Provide a monitor module for all sprinkler system tamper and flow switches.
7. Provide a monitor module for sprinkler system hotbox heater power and tamper switches.
8. Provide a monitor module for kitchen hood suppression system.

1.02 GENERAL CONDITIONS

- A. The General Conditions and Supplementary General Conditions are a part of this section of these Specifications. The Contractor is cautioned to read and be thoroughly familiar with all provisions of the General Conditions. These conditions shall be complied with in every aspect.

1.03 DEFINITIONS:

- A. The word "shall" where used, is to be understood, as mandatory and the word "should" as advisory. "May" is used in the permissive sense.
- B. Concealed: Concealed areas are those areas that cannot be seen by building occupants.
- C. Exposed: Exposed areas are all areas that are exposed to view by building occupants, including areas below counter tops, inside cabinets and closets, inside all equipment rooms, and areas outside the building exterior envelope.
- D. Feeder: Feeder consists of both conduit and wiring installed above or below grade
- E. Provide: Provide shall including furnishing, installing, and connecting the item or items referenced unless specifically indicated otherwise.

1.04 QUALITY ASSURANCE

- A. General:
 1. Every effort has been made by the Engineer to clearly indicate all devices/equipment requiring an electrical/data connection. It is the intent of the Engineer that all light fixtures be powered and controlled, that all devices and equipment be circuited to a panelboard of appropriate voltage and breaker of MOCP not exceeding manufacturer's specifications. That all communications, security, and fire alarm devices are installed, wiring, and functioning properly.
 2. Where there is a conflict between the contract document and an applicable Code. The Code shall govern except where the requirements of the contract documents are more stringent. The most stringent requirement shall apply.
 3. All work shall be concealed unless specifically noted to be exposed.
 4. Coordinate the exact locations of electrical outlets and equipment with building features and equipment as indicated on architectural, structural, mechanical, plumbing, landscape, and food service drawings. Review any/all proposed changes in electrical device/equipment locations with Architect prior to rough-in. Architect may direct relocation of outlets before rough-in, up to ten (10) feet from the position indicated, without additional cost. Remove and relocate outlets placed in unsuitable locations when requested by the Architect, at no additional cost.
 5. Resolve, in writing, any code violation discovered in contract documents with the Engineer prior to bidding. After award of the contract, Contractor shall make any correction or addition necessary for compliance with applicable codes at no

additional cost.

- B. An approved contractor for the work under this division shall be:
 - 1. A licensed electrical contractor in the jurisdiction in which the work shall be performed.
 - 2. Able to furnish evidence of having contracted for and installed not less than three (3) systems of comparable size and type that have served their Owners satisfactorily for no less than three (3) years.
- C. All work, materials and equipment shall comply with the latest applicable codes, local ordinances, and UL requirements.
- D. Provide new products of manufacturers regularly engaged in production of such equipment. Provide the manufacturer's latest standard design for the type product specified. All new products shall be listed for the use shown on drawings.
- E. Equipment shall be delivered with a factory-applied finish so that no additional field painting is required.
- F. Equipment shall be selected to conform the building space limitations. Do not provide equipment that cannot meet the arrangement requirements shown on plans. Contractor shall submit room layouts with submitted items shown drawn to scale. Submittals will be rejected without floor plan Drawings showing submitted items.
- G. All equipment included in the service and distribution specifications shall be provided by the same manufacturer.
- H. Manufacturer names and model numbers are subject to change. Contractor shall verify them with manufacturer's representative prior to ordering any product or equipment.

1.05 GENERAL REQUIREMENTS

- A. The Contractor is referred to all of the Drawings for building construction as well as the electrical Drawings.
- B. The Contractor shall examine the site and shall verify to his own satisfaction the location of all utilities, and shall adequately inform himself as to their relation to his work before entering into a Contract and he shall base his bid on any conditions, which may be encountered during the progress of the work.
- C. The Contractor shall furnish and install properly all materials, devices, equipment, supports, controls, appurtenances, etc., mentioned or required to make complete or satisfactory installations in working order whether shown or not. All electrical equipment shall be connected in accordance with manufacturer's instructions. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when completed.
- D. The Contractor shall provide finished to match approved samples; all exposed finishes shall be approved by the Architect. Submit color samples as required.

1.06 APPLICABLE GENERAL CODES AND REGULATIONS

- A. All electrical work and equipment, in whole or in part, shall conform to the applicable

portions of the following specifications, codes and regulations in effect on that date of invitation for bids, and shall form a part of this specification.

- B. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition.
- C. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
 - 1. NFPA 70, National Electrical Code
 - 2. National Fire Codes:
 - a. NFPA 70E, Electrical Safety Requirements for Employee Workplaces
 - b. NFPA 72, National Fire Alarm Code
 - c. NFPA 77, Static Electricity
 - d. NFPA 101, Life Safety Code
 - e. NFPA 110, Emergency and Standby Power Systems
 - 3. Occupational Safety and Health Regulations (OSHA).
 - 4. NFPA Standards in effect shall be as listed or adopted by the appropriate authority having jurisdiction.
 - 5. American National Standards Institute (ANSI)
 - 6. Institute of Electrical and Electronics Engineers (IEEE)
 - 7. Local, City and State Codes and Ordinances
 - 8. Regulations and standards of the Electric Utility Company
 - 9. National Electrical Safety Code (NESC)
 - 10. National Electrical Manufacturers Association (NEMA)
 - 11. Insulated Power Cable Engineers Association (IPCEA)
 - 12. International Building Codes (IBC)
 - 13. International Energy Conservation Codes (IECC)
- B. Equipment that has been inspected and approved by the Underwriter's Laboratory shall bear its label or appear on its list of approved apparatus.

1.07 DRAWINGS

- A. Plans and detail sketches are submitted to limit, explain, and define conditions, specified requirements, conduit sizes, and manner of erecting work. The Contractor is cautioned to field check and verify all existing conditions before bidding, as no extra compensation will be allowed for conditions found different than represented in the construction drawings and/or specifications. Written approval of the Architect shall be obtained prior to any alterations or additions to specified work.
- B. 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, but specified sizes and requirements necessary for satisfactory operations shall remain unchanged.
- C. The drawings and these specifications are complementary to each other and what is called for by one shall be binding as if called for by both.
- D. General arrangement of work is indicated on plans. Due to the small scale of the drawings, offsets, fittings, and boxes required are not all indicated; provide fittings, boxes, etc., as needed in accordance with codes and accepted practices.

1.08 SUPERVISION

- A. The Contractor shall personally or through an authorized and competent representative, constantly supervise the work from beginning to completion and final acceptance. So far as possible, he shall keep the same foreman and workmen throughout the project duration.
- B. During its progress, the work shall be subject to inspection by representatives of the Architect or Engineer, at which times the Contractor shall furnish required information.
- C. It is not the Architect's or Engineer's duty to direct or guarantee the work of the Contractor, but to assist the Owner in obtaining a complete building in accordance with plans, specifications and addenda and to furnish engineering services in accordance with recognized practices.

1.09 PRIOR APPROVALS

- A. The Contractor shall base his proposal on materials as specified herein. Any references to a specific manufacturer or trade name is made to establish a standard of quality and to define a type of product and in no way is intended to indicate a preference for a particular manufacturer. It is the intent of these specifications to allow all manufacturers of equipment, products, etc., judged equal to the specified product to bid on a competitive basis.

1.10 MEASUREMENTS

- A. The Contractor shall verify all measurements and shall be responsible for the correctness of same, before ordering any materials or doing any work. No extra charge or compensation will be allowed for any differences between the actual measurements and those indicated on the drawings.

1.11 LAWS, PERMITS AND FEES

- A. The entire electrical work shall comply with the rules and regulations of the City, Parish, and State, including the State Fire Marshal and State Board of Health, whether so shown on plans or not. The Contractor shall pay fees for permits, inspections, etc., and shall arrange with the inspecting authorities all required inspections.

1.12 SITE INSPECTION

- A. The Contractor shall visit the site and familiarize himself with difficulties attendant to the successful execution of the work before bidding. Failure to visit the site shall not relieve the Contractor of the extent or conditions of the work required of him.

1.13 TEMPORARY FACILITIES

- A. The Contractor shall provide all temporary power and lighting for construction purposes. Installation of temporary power shall be in accordance with NEC Article 527.
- B. Temporary facilities, wire, lights, and devices are the property of the contractor and shall be removed by the Contractor at the completion of the Contract.

PART 2.00 PRODUCTS

2.01 MATERIAL AND EQUIPMENT

- A. All materials, equipment, and accessories installed under this Contract, whether approved or not, shall be new and shall conform to all rules, codes, etc., as recommended or adopted by the National Association(s) governing the manufacture, rating and testing of such materials, equipment, and accessories.
- B. Product Substitutions
 1. If item of equipment or device offered as Substitution differs in dimension or configuration from that indicated in the Contract Documents, provide, as part of the substitution submittal, a drawing that shows that the equipment or devices proposed for Substitution can be installed in the space available without interfering with other trades or with access requirements for operations and maintenance in the completed project. Drawings shall be of appropriate scale but shall not be smaller than a scale of 1/4-inch equals one foot.
 2. Where substitute equipment or devices requires different arrangement or connections from that indicated in the Contract Documents, install the equipment or devices to operate properly and in accordance with the requirements of the Contract Documents. Make incidental changes necessary in piping, ductwork or wiring which results from the inclusion of the substitute equipment or device without any additional cost to the Owner. Pay all additional costs incurred by other trades in connection with changes required by the inclusion of the substituted equipment or device in the Work.

2.02 SHOP DRAWINGS & SUBMITTALS

- A. Shop drawings shall be taken to mean detailed drawings with dimensions, schedules, weights, capacities installation details, and pertinent information that will be needed to describe the material or equipment in detail.
 1. Shop drawings shall be prepared using computerized digital software compatible with AutoDesk's AutoCAD
 2. Submit hardcopy of Shop Drawings in the quantity as required under Division 01. Hardcopies of Shop Drawings shall have each sheet clearly labeled with a unique sheet identification number.
 3. In addition to hardcopies required by Division 01, submit one copy of Shop Drawings in electronic format on Flash Drive. Files contained shall be named to correspond with the sheet names contained in the hardcopy set. Files on shall include both AutoCAD compatible source files and files printed to Portable Document Format (.pdf).
- B. Submittals shall be taken to mean catalog cuts, general descriptive information, catalog numbers, and manufacturer's name.
- C. Review of submittals or shop drawings shall not remove the responsibility for furnishing materials or equipment of proper dimensions, quantity and quality; nor will such review remove the responsibility for error in the shop drawings or submittals.
- D. Assume all costs and liabilities, which may result from the ordering of any material, or

equipment prior to the review of the shop drawings or submittals, and no work shall be done until the shop drawings or submittals have been reviewed. In case of correction or rejection, resubmit until such time as they are accepted by the Owner's representative and such procedures will not be cause for delay. After the final review, 6 copies will be supplied if requested.

- E. Shop drawings and submittals will be returned unchecked if the specific items proposed are not clearly marked, or if the general Contractor's approval stamp is omitted.
- F. Shop drawings, unless mark-ups are very trivial, will not be returned, "No Exception Taken". They will be returned for re-submittal as many times as necessary, however, the Contractor shall be back charged for engineering review time beginning with the second resubmittal. Therefore, the Contractor should make every effort to comply with the requirements of this Project on the first submittal in order to avoid project delays.
- G. The Contractor shall submit to the Architect complete descriptive and dimensional data on the following items for review and approval when specified or provided:
 - 1. Cable Tray
 - 2. Disconnect Switches
 - 3. Electrical Contactors
 - 4. Electrical Controls and Time Switches
 - 5. Emergency/Standby generator set and transfer switches
 - 6. Enclosed Circuit Breakers
 - 7. Fire Alarm System Panels, Initiation Devices, and Annunciation Devices
 - 8. Fire Rated Cables and Connectors
 - 9. Lighting Controls and Occupancy Sensors
 - 10. Lighting Fixtures
 - 11. Lightning Protection System
 - 12. Panelboards and enclosures
 - 13. Site Lighting Poles and Fixtures
 - 14. Surface Raceways
 - 15. Surge Protection Devices
 - 16. Switchboards
 - 17. Transformers
 - 18. Wiring Devices

PART 3.00 METHODS OF INSTALLATIONS

3.01 CONTRACTOR COORDINATION

- A. The Drawings are diagrammatic in nature. Cooperate with other trades so the interferences of facilities and equipment will be avoided.
- B. Contractor to coordinate with door hardware provider, architect and owner prior to installation of any devices associated with doors to verify door operational requirement, placement of proximity readers, motion sensors, door switches, fire alarm control, magnetic locks, hold open devices, etc..
- C. Contractor to coordinate with architectural millwork shop drawings prior to rough-in for locations of under counter lighting to be installed in and around millwork. No receptacles shall be installed in an enclosed cabinet unless noted on the drawings. Outlets for refrigerators, microwaves, etc. shall be installed in the space identified on the millwork shop drawings.

- D. Contractor shall not penetrate any stair wall assemble with conduit, boxes, cabling and the like, except for items that serve the stairwell.
- E. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer. Verify that all materials, equipment and devices proposed for use on this Project are within the constraints of the allocated space.
- F. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping installed at required slope. So, connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- G. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

3.02 OPENINGS, CUTTING AND PATCHING

- A. Cut all openings as required for the electrical work. Patching will be done by the various crafts whose work is involved. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such times and in such a manner as not to delay or interfere with the work of other Contractors. Caulk, flash or otherwise make weatherproof all penetrations through the roof and exterior walls.
- B. Where conduit, cable or other items that are provided for under this contract penetrate fire rated walls or floors, the Contractor is to seal around the item to maintain the integrity of the rated system.

3.03 PAINTING

- A. Painting shall be performed as described in the painting specifications. No painting will be required by the Contractor except for touch-up of factory finishes on equipment furnished under this contract.

3.04 INSTALLATION

- A. Housekeeping Pads: All floor and ground mounted electrical equipment - panels, switchboards, motor control centers, transformers, etc. shall be installed with a reinforced concrete housekeeping pad, whether shown on the drawings or not. The pad shall extend 4" above either the finished floor or final grade (as applicable), have 45 degree chamfered edges, and be constructed of 3000psi concrete. The pad shall extend 4" beyond the edge of the respective electrical equipment. Concrete shall have smooth steel trowel finish.
- B. Equipment must be leveled and set plumb. Use corrosion resistant mounting hardware. For sheet metal enclosures mounted against a wall provide corrosion-resistant spaces to separate the wall by 1/4 inch or by 3 inches of air for freestanding units.

- C. Unused knockouts on panels and boxes shall be covered with approved cover plates manufactured for the purpose.

3.05 TESTS AND INSPECTIONS

- A. The Contractor shall assist in making periodic inspections or tests required by the Architect or Engineer. When requested, the Contractor shall provide the assistance of foremen and qualified craftsmen for reasonable duration of each test, etc.
- B. The contract will not be declared to be substantially complete until all of the following conditions are satisfied.
 - 1. the functional operation of the subsystems have been demonstrated and verified and reports have been provided, reviewed and accepted.
 - 2. The "As-Built" drawings have been submitted, reviewed and accepted by the Architect / Owner / Owner's Construction Representative.

3.06 SAFETY PRECAUTIONS DURING CONSTRUCTION

- A. It shall be the Contractor's responsibility to furnish and install proper guards and instruction signs for prevention of accidents and to provide and maintain for the duration of construction any installations needed for safety of life and property.

3.07 CONNECTIONS

- A. This Contractor shall be responsible for providing electrical service to all devices of the heating and air conditioning system, and is referred to the mechanical plan for the exact location of the various devices.
- B. Mechanical Controls: Provide 120VAC power connections as required to components of Mechanical Control system. Coordinated quantity of circuits, connection requirements and locations between trades and with provisions of Divisions 21, 22, and 23 sections.
- C. Security and Access Control: Where the Drawings indicate a 120VAC circuit in a general area labeled for security or access control use, the intent is for this circuit to be extended and connected to the security or access control device in that general area in coordination with other trades. Coordinated connection requirements and locations between trades and with Owner's Security vendor prior to installation.
- D. Motors and Motor Connections: Motors for driven equipment are specified in Divisions 21, 22, and 23. Provide connections as follows, unless otherwise indicated:
 - 1. Equipment provided with factory installed disconnecting means: Upon installation of motor and associated equipment, Provide the electrical installation in accordance with approved wiring diagrams and manufacturer's written instructions.
 - 2. Equipment furnished with factory disconnecting means: Upon installation of motor and associated equipment, Install factory furnished disconnecting means and provide the electrical installation in accordance with approved wiring diagrams and manufacturer's written instructions.
 - 3. Equipment not furnished with factory installed disconnecting means: Provide disconnect switch required in accordance with NFPA 70 or as indicated on the

Drawings. Provide the electrical installation in accordance with approved wiring diagrams and manufacturer's written instructions.

3.08 LOAD BALANCING

- A. Balance load on all phases in each panel to within 10% of respective phase loads.

3.09 IDENTIFICATION OF EQUIPMENT

- A. Identification of Equipment: Refer to specification 26 05 53 Identification for Electrical Equipment.

3.10 COMPLETION

- A. The Contractor shall leave all electrical equipment with proper connections, and in proper working order. He shall test the entire electrical system to show that it is properly installed. Contractor shall leave all panels and switches completely fused or complete with circuit breakers.

3.11 RECORD DRAWINGS

- A. The Contractor shall furnish one (1) complete set of drawings on which any changes in the work shall be shown. In addition to changes in work contractor shall clearly indicate routing of all feeders both above and below ground. All underground conduit shall be noted on drawings to show "as built" locations. These drawings must be turned over to the Architect prior to final acceptance of the work.

3.12 GUARANTEE

- A. The Contractor shall guarantee to keep the entire electrical system as installed by him or his subcontractors in repair and in perfect working order for one (1) year from the date of the final Certification of Final Acceptance, and shall furnish free of cost to the Owner, all material and labor necessary to comply with the above guarantee; said guarantee shall be based upon defective material and workmanship. In any case where equipment has a factory warranty exceeding this one-year limit, the full extent of the warranty shall apply.

3.13 CLEANING

- A. When all work has been finally tested, the Contractor shall clean all fixtures, equipment, conduits, ducts, and all exposed work. All cover plates and other finished products shall be thoroughly cleaned.

3.14 INSTRUCTION MANUALS

- A. The Contractor shall provide three (3) operating and maintenance instruction manuals on all systems and equipment installed in the electrical work.
- B. The Contractor shall provide (3) copies of all warranties and guarantees for systems, equipment, devices, and materials.

3.15 CONTRACTOR SPECIAL NOTE

- A. The Contractor is again cautioned to refer to all parts of these Specifications and all Drawings, not just electrical sections, and the individual cross references made to other standard specifications or details describing any electrical work, which may be required under these other sections. The Contractor is cautioned to note carefully any other sections which may reference electrical work in order for this Contractor to fully understand the wiring requirements and electrical work that is required. Any conflicts found between the electrical sections of these Specifications or Drawings shall be immediately directed to the General Contractor for clarification.
- B. These Specifications and the electrical Drawings size equipment, wire, conduit, etc. based on the horsepower of motors and/or wattages of equipment as shown on the plans or specified herein. The Contractor shall install electrical raceways, conductors, fuses, safety switches, breakers, contactors, starters or any other electrical equipment with the capacities to suit the horsepower and/or wattages of the equipment actually furnished and installed. The Contractor shall not furnish or install any electrical raceways, conductors, safety switches, contactors or motor starters of sizes smaller than those shown on the Drawings or specified herein. The Contractor shall coordinate with the various sections of the Specifications and/or Drawings and with the various Sub-Contractors to provide the properly sized equipment without additional cost to the Owner.

END OF SECTION

DIVISION 16 – ELECTRICAL
SECTION 16050 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1.00 GENERAL

1.01 SECTION INCLUDES

- A. Furnish and install items for identification of electrical products installed under Division 26.

1.02 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.03 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes and standards. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2.00 PRODUCTS

2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
 - 1. Power Circuits: Black letters on an orange field.
 - 2. Legend: Indicate system or service and voltage, if applicable.
 - a. Typical:
 - 1) Type: Example – AC 60 Hertz
 - 2) Load: Example – Lighting and Power
 - 3) Voltage: Example – 120VA / 1 Phase
 - b. As Required

- 1) If more than one type of power is available in a conduit, then it shall be marked with the title "Electrical" on orange background.
 - 2) If used for control of HVAC conduit shall be marked with the title "Control" on an orange background
 - c. Conduit that contains communication systems shall have the exact content and title on blue background.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.02 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.03 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
 2. Compounded for permanent direct-burial service.
 3. Embedded continuous metallic strip or core.
 4. Printed legend shall indicate type of underground line.

2.04 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
- D. Warning label and sign shall include, but are not limited to, the following legends:
1. Warning label and sign shall include, but are not limited to, the following legends:
 2. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 3. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR ## INCHES."

Verify work space required for specific project conditions with NFPA 70 and replace “##” in previous sentence with appropriate distance.

4. Arc Flash Warning and Instructions: “WARNING – ARC FLASH AND SHOCK HAZARD. WEAR APPROPRIATE PPE. Determine appropriate protective clothing and personal protective equipment (PPE) for the task from NFPA 70E.

2.05 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
- B. Engraved legend with black letters on white face.
- C. Punched or drilled for mechanical fasteners.
- D. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.06 ONE-LINE DIAGRM NAMEPLATE

- A. Preprinted engraved, laminated acrylic or melamine plastics sign. Nominal size, 12 by 12 inches (305 by 305 mm) by 1/8 inch (3.2 mm) thick. Engraved legend with black letters on white face. Image on sign depicting equipment components in single-line diagram format, using symbols and letter designations consistent with final one-line bus diagram. Produce a concise visual presentation of principal equipment components and connections.

2.07 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch. Lettering and Background colors as indicated below:
 1. Power Circuits:
 - a. Normal: White lettering on Black background.
 - b. Emergency Optional Standby: White lettering on Purple background.
 2. Fire Alarm System: Black lettering on Red background.
 3. Fire-Suppression Supervisory and Control System: Yellow lettering on Red background.
 4. Combined Fire Alarm and Security System: Blue lettering on Red background.
 5. Security System: Blue lettering on Yellow background.
 6. Mechanical and Electrical Supervisory System: Green lettering on White background.
 7. Telecommunication System: Blue lettering on White background.
 8. Control Wiring: Green lettering on White background.

2.08 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties : Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 1. Minimum Width: 3/16 inch (5 mm)
 2. Tensile Strength: 50 lb (22.6 kg), minimum
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black, except where used for color-coding.

- B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3.00 EXECUTION

3.01 APPLICATION

- A. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- B. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
- C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
 - 3. Arc Flash Warning Labels: Apply label to door or cover at all access point of equipment including, but not limited to, the following:
 - a. Disconnect switches
 - b. Enclosed circuit breakers
 - c. Panelboards
 - d. Power transfer equipment (ATS/MTS)
 - e. Transformers
- F. Junction Boxes and Pull Boxes: Identify voltage, source, and circuit number(s) on cover of pull

and junction boxes with hand-written legible block lettering using black permanent marking pen.

G. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer load shedding, Kirk Key Controlled Breakers.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. This applies to existing equipment that is modified during this project. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled Shall Include But Not Be Limited To:

- a. Panelboards, electrical cabinets, and enclosures.
- b. Access doors and panels for concealed electrical items.
- c. Transformers.
- d. Emergency system boxes and enclosures.
- e. Disconnect switches.
- f. Enclosed circuit breakers.
- g. Power transfer equipment. (ATS/MTS)
- h. Contactors.
- i. Fire-alarm control panel and annunciators
- j. Power-generating units.
- k. All junction boxes. Label to include circuit numbers (panel and number).
- l. All receptacle device plates shall be etched with circuit numbers. (panel and number).
- m. All lighting switch plates shall have circuit numbers on the back of the plate. (panel and number).

Examples:

NORMAL 'HA' 480Y/277V FED FROM 'MDP'	EMERGENCY SYSTEM 'ATS-LS' 480Y/277V FED FROM 'MDP' NORMAL	NORMAL 'T-LA' 75KVA, 480V to 208Y/120V FED FROM 'HA'
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	FED FROM 'EMSB' EMERGENCY FEEDS 'LS-HA'	FEEDS 'LA'
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3. Provide for each feeder overcurrent protective device in each switchgear, switchboard, distribution panelboard, motor control center, and any other similar equipment furnished under this Division, identification as to the specific load that it serves.

- I. Existing Panel Schedules: Any existing panel where a circuit was removed, relocated or added, the contractor shall provide a new panel schedule with updated information.

3.02 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- G. Color-Coding for Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 1. Color shall be factory applied or for sizes larger than No. 1 AWG, if authorities having jurisdiction permit, field applied.
 2. Colors for Grounding Conductors:
 - a. Equipment Grounding Conductor: Green.
 - b. Isolated Equipment Grounding Conductor: Green with Yellow Stripe.
 3. Colors for 208/120-V Wye Systems:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - d. Grounded Conductor (Neutral): White
 4. Colors for 480/277-V Wye Systems:
 - a. Phase A: Brown.
 - b. Phase B: Purple.
 - c. Phase C: Yellow.

- d. Grounded Conductor (Neutral): Gray
- 5. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
- J. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16060 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1.00 GENERAL

1.01 SUMMARY

- A. NFPA 70 and IEEE C2 include basic grounding requirements for electrical safety. This Section supplements the minimum safety requirements of the Code with requirements for additional grounding and with optional grounding methods and materials for both power and electronic systems.
- B. This Section includes methods and materials for grounding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Common ground bonding with lightning protection system.

1.02 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For independent agency as defined in Division 26 Section "Common Work Results for Electrical".
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with UL 467 for grounding and bonding materials and equipment.
- D. Comply with NFPA 70
- E. Comply with IEEE C2
- F. Comply with ANSI/EIA/TIA-607

PART 2.00 PRODUCTS

2.01 CONDUCTORS

- A. Insulated Conductors: Copper or Tinned-Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

5. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 7. Main Bonding Jumper: stranded copper conductors sized as indicated on Drawings.
 8. Grounding Electrode Conductor: stranded copper conductors sized as indicated on Drawings.
 9. Common Grounding Electrode Conductor: stranded copper conductors sized as indicated on Drawings.
- C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 4 inches (6 by 100 mm) in cross section, unless otherwise indicated; with insulators. Length as indicated on Drawings.

2.02 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 inch (16 mm) diameter by 120 inches (3000 mm) long, unless otherwise indicated.

PART 3.00 EXECUTION

3.01 APPLICATIONS

- A. Conductors: Install insulated solid conductor for No. 10 AWG and smaller, and insulated stranded conductors for No. 8 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 3/0 AWG minimum, unless otherwise indicated.
 1. Bury at least 30 inches (762 mm) below grade.
 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal

inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

- D. Grounding Bus: Install in electrical and telephone/communications equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- E. Conductor Terminations and Connections: Use the following connectors styles, unless otherwise indicated.
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Exothermic Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Exothermic Welded connectors.
 - 5. Connections to Ufer Ground: Exothermic Welded connectors.
- F. Comply with ANSI-607 requirements for telephone/communications grounding riser

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Handholes: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before handhole/manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Pad-Mounted Transformers and Switches: The following is a minimum if the utility company does not have requirements, otherwise meet the utility company requirements. Install two ground rods and a ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with transformer, switch, or substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the edge of foundation.
- D. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable

shields as recommended by manufacturer of splicing and termination kits

3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
 - 1. Bond to each device, box, or luminaire, unless otherwise indicated.
 - 2. Conductor insulation of the same rating as the phase conductors, for all feeders and branch circuits. Install the grounding conductors in the raceway with related phase and neutral conductors.
 - 3. Where parallel conductors in separate raceways occur, provide a grounding conductor in each raceway that meets requirements of NFPA 70.
- B. Dry-Type Transformers: Install an insulated grounding conductor from the common point of connection of the transformer secondary neutral point and the transformer enclosure to the following:
 - 1. The nearest grounding electrode per NFPA 70, including but not limited to building steel where available.
 - 2. The grounding bus of the common electrode grounding system, located in the electrical equipment room.
- C. Enclosures: Install an insulated grounding conductor from grounding bushings to the frame of the enclosure, ground bus, and equipment grounding strap where each occurs. Install grounding bushings on all raceways terminating within electrical enclosures constructed of separate enclosure panels, which are not integrally welded together.
- D. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including but not limited to air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- E. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4 (6-by-1000) grounding bus. Length as indicated on the drawings.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.04 INSTALLATION

- A. Provide permanent service neutral and equipment grounding in accordance with NFPA 70 and subject to the following additional requirements.

- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Comply with mounting and support requirements specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- D. Connect the service neutral and equipment ground to a common point within the metallic enclosure containing the main service disconnecting means. Equipment grounds and the identified neutral of the wiring system shall not be interconnected beyond this point in the interior wiring system. From the common point of connection of the service neutral and the equipment ground, run in non-magnetic conduit a grounding electrode conductor without joint or splice to the grounding electrode system and connect it with an approved bolted pressure clamp.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
 - 4. Where expansion joints or telescoping joints occur, provide bonding jumpers.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Ground Rods: Drive rods until tops are 12 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor a minimum of 30-inches below grade unless otherwise indicated. Make connections without exposing steel or damaging coating, if any.

2. For grounding electrode system, install at least three rods spaced at least two-rod lengths from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- I. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
 1. Test Wells: Install at least three test wells for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- J. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- K. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.
 1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.05 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components as specified in Division 26 Section "Identification for Electrical Systems."

3.06 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare certified test reports:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum at service disconnect enclosure grounding terminal, at ground test wells, at individual ground rods and locations where a ground-resistance level is specified,. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Correct Deficiencies, Retest and Report:
 1. Correct unsatisfactory conditions, and retest to demonstrate compliance; replace conductors, units, and rods as required to bring system into compliance.
 2. Prepare a report, certified by testing agency, which identifies components checked and describes results. Include notation of deficiencies detected, remedial action

taken, and observations and test results after remedial action.

END OF SECTION

DIVISION 16 – ELECTRICAL
SECTION 16070 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. RMC: Rigid metal conduit.
- E. RAC: Rigid aluminum conduit.
- F. RNC: Rigid nonmetallic conduit.
- G. RSC: Rigid Steel conduit.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, raceways using NFPA 70 criteria and performance requirements and design criteria indicated.
 - 1. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- B. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.

2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
1. Trapeze hangers. Include Product Data for components.
 2. Steel slotted channel systems. Include Product Data for components.
 3. Nonmetallic slotted channel systems. Include Product Data for components.
 4. Equipment supports.
 5. Concrete Based for Equipment.
- C. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.07 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2.00 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.

- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 4. Rated Strength: Selected to suit applicable load criteria.
- C. Device Box Mounting Brackets and Stabilizer: Factory-fabricated sheet steel brackets for support of device boxes adjacent to or between studs.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- D. Through-Stud Cable and Raceway Support Clips: Factory-fabricated spring steel clip for cables or raceways where run horizontally through metal studs.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- E. Roof-mounted Raceway Support Blocking: Factory-fabricated support blocking for use under roof-mounted raceways. Wedge-shaped blocking constructed of 100% recycled UV-resistant Rubber with integral galvanized steel strut to accept raceway support clips.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- F. Tee Bar Grid Box Hanger: Factory-fabricated metal electrical box hanger for supporting boxes at locations between ceiling system t-grid components. Height adjustable for various electrical box depths. Attached to ceiling tee bar with screws or integral clamp for stability. Includes tab for independent support wire attachment.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
- G. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- H. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- I. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- J. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- K. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3.00 EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Horizontal and Vertical Support Spacing for Raceway(s): Space supports for EMT, IMC, and RMC as required by NFPA 70, but in no case less than listed below:
 - 1. For raceways 1" diameter and larger, provide one hanger at 8'-0" on center.
 - 2. For raceways less than 1" diameter, provide one hanger at 5'-0" on center.
- C. Minimum Hanger Rod Size for Raceway Supports: Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- D. Single Raceways or Cables:
 - 1. For Raceways 1-1/4-inch (32mm) and smaller: Install adjustable steel band hanger suspended on threaded rod.
 - 2. For Raceways larger than 1-1/4-inch (30mm): Install trapeze-type supports fabricated with steel slotted support system suspended on threaded rods. Size trapeze members, including the suspension rods, based on the support required for the size, and loaded weight of the conduits.
 - a. Secure raceway or cable to support with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- G. Corrosive Areas: Provide non-metallic slotted support systems for supports installed in corrosive areas. Corrosive areas include, but are not limited to the following:
 - 1. Pools and Pool Equipment Areas.
 - 2. Within 25-feet (7.62-m) of Cooling Towers and Air Cooled Chillers.

3.02 SUPPORT INSTALLATION

- A. Comply with NFPA 70, NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC RMC EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Fasten junction, pull and devices boxes securely to the building construction, independent of raceway system.
- D. Install Device Box Mounting Brackets supported between two studs. Do not attached Receptacle boxes directly to a single stud.
- E. Install Through-Stud Cable and Raceway Support Clips where cables or raceways run horizontally through metal studs.
- F. Support raceways at a distance above suspended ceilings to permit removal of ceiling panels and luminaires.
- G. Locate raceways so as not to hinder access to mechanical equipment.
- H. Do not secure conductors, raceways, or supports to suspended ceiling hanger rods or wires.
- I. Install Tee Bar Grid Box Hanger supported between two ceiling grid tee bars where devices boxes are located flush in recessed suspended ceilings.
 - 1. Install at least one independent support rod from box hanger to structure.
- J. Install Roof-mounted Raceway Support Blocking where raceways run on across roofing.
 - 1. Coordinate installation of roof supports with items specified in Division 07 Section "Roof Accessories." Provide products compatible with rooftop materials included in the Work.
- K. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- L. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4

inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

- M. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on

miscellaneous metal.

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16120 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. building wires and cables rated 600V and less
 - 2. Connectors, splices and terminations rated 600 V and less
 - 3. Sleeves and sleeve seals for cables

1.03 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

PART 2.00 PRODUCTS

2.01 CONDUCTORS AND CABLES

- A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- B. Conductor Material: Copper unless indicated otherwise on Drawings; stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- C. Conductor Insulation Types: Comply with NEMA WC 70 for Types THHN-THWN, XHHW, and SO, as indicated.
- D. Multiconductor Cables: Comply with NEMA WC 70; Exterior sheath color coded to differentiate cable voltages and quantity of phase conductors.
- E. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- F. Conductor Temperature Rating: Provide conductors with 75 degree C rating. For high temperature applications, provide conductors with temperature ratings in accordance with NDPA 70 for ambient condition.

PART 3.00 EXECUTION

3.01 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
- I. Fire Alarm Cabling: Plenum rated, exposed. Secured per NFPA 70-760.
- J. Combining of more than three circuits in a conduit is not allowed. IE no more than three phase conductors.
- K. Single Phase Circuits: Provide a dedicated neutral. Sharing of neutrals is not allowed.
- L. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.02 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Run feeders in continuous lengths, without joints or splices. Where continuous runs are impractical; obtain Engineer's approval for splice locations and application.
- C. Run branch in continuous lengths, without joints or splices. Where continuous runs are impractical it shall be permitted to splice, however no splices shall be permitted within in-grade pull boxes.
- D. Make joints in branch circuits only where circuits divide.
- E. Do not use gutters of panelboards as raceways, junction boxes, or pull boxes for conductors

not terminating in said panelboards.

- F. Run conduits for emergency power conductors separate from all other wiring.
- G. Bundling Conductors: Bundle conductors in switchboards, panelboards, cabinets, and the like, using nylon ties made for the purpose. Bundle conductors larger than No. 10 in individual circuits. Smaller conductors may be bundled in larger groups.
- H. Terminations of multiple branch circuit conductors on a single circuit breaker is not acceptable.
- I. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours. Install all conductors in raceways, unless specifically noted otherwise.
- J. Support cables according to Section "Basic Electrical Materials and Methods."
- K. Identify and color-code conductors and cables according to Section "Identification for Electrical Equipment"
- L. Sizes:
 - 1. Provide conductors no smaller than No. 12 AWG, except for signal or control circuits.
 - 2. Use #10 AWG conductors for 20 amperage 120V circuits when the circuit conductors are longer than 75 feet.
 - 3. Use #10 AWG conductors for 20 amperage 277V circuits when the circuit conductors are longer than 200 feet.
 - 4. Provide neutral conductors of the same size as the phase conductor(s) for individual branch circuit homeruns.

3.03 WIRE PULLING

- A. Pull no conductors into conduits until all Work of a nature which may cause injury to conductors is completed.
- B. Follow manufacturers' recommendations for regulating temperature conditions of conductors prior to installation.
- C. Exercise care in handling and installing cables to avoid damage. Carefully form cables in equipment pull boxes. Form bends in cables larger than the minimum radii shown in the cable manufacturer's published data for minimum bends such that bends will not reduce the cable life.
- D. Provide suitable installation equipment to prevent abrasion and cutting of conductors by raceways during the pulling of conductors. Use ropes of polyethylene, nylon or other suitable non-metallic material to pull in feeders. Metallic ropes are prohibited.
- E. Before any wire is pulled into any conduit, thoroughly swab the conduit to remove all foreign material and to permit the wire itself to be pulled into a clean, dry conduit.

- F. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- G. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B
- B. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.
- C. Provide temperature ratings of connectors and splices to match wire rating.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16130 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Refer to architectural for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
 - 2. "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

- A. Product Data: For surface raceways, floor boxes, and cabinets.
- B. Coordination Drawings: Submit Coordination Drawings in accordance with Division 26 Section "Basic Electrical Requirements". Include the following:
 - 1. Raceway routing plans, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - a. Proposed cable pull points.
 - b. Structural members in the paths of conduit groups with common supports.
 - c. HVAC, plumbing items, and architectural features in the paths of conduit groups. Denote where systems share common supports.

- d. Purposed splice locations.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70-Latest edition or edition enforced by state and local code authority.

1.06 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2.00 PRODUCTS

2.01 METAL WIREWAYS

- A. Material and Construction: Sheet metal sized and shaped as indicated.
 - 1. Indoors: NEMA-1
 - 2. Outdoors: NEMA-3R
- B. Fittings and Accessories:
 - 1. Include couplings, offsets, elbows, expansion joints, adapters, hold- down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
 - 2. Provide spring nuts or guards on all screws installed toward the inside to prevent wire insulation damage.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70 and UL 870.
- D. Wireway Covers:
 - 1. Hinged type unless access restrictions require screw-cover type.
 - 2. Flanged-and-gasketed as required for NEMA type
- E. Finish: Manufacturer's standard enamel finish.

2.02 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and two coats of paint. Color by Architect.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

- C. Surface raceways used together with couplings, clips, bushings, straps, connectors, connection covers, elbows, boxes, extension boxes, fixture boxes, extension adapters, blank covers and all other required fittings; size to accommodate the conductors to be installed therein in each case.

2.03 BOXES, ENCLOSURES, AND CABINETS

- A. Floor Boxes: Cast metal, fully adjustable, rectangular with four separate wiring compartments for power outlets, phone and data outlets as indicated on the drawing.
 - 1. Provide products by the following manufactures or submit prior approval for equals.
 - a. Wiremold RFB4E Series
 - b. T&B 665 Series
 - 2. Covers shall be UL Listed to U.S. and Canadian safety standards for tile, carpet, wood, bare concrete and terrazzo floors. Covers shall be selected by the architect.
- B. Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- C. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum, type FD with gasketed cover.
- D. Hinged-Cover Enclosures: with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
 - 3. Ratings:
 - a. Indoor Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
- E. Cabinets:
 - 1. Hinged door in front cover with flush latch and concealed hinge.
 - 2. Key latch to match panelboards.
 - 3. metal barriers to separate wiring of different systems and voltage and
 - 4. Accessory feet where required for freestanding equipment.
 - 5. Feet: Provide accessory feet for free standing equipment.
 - 6. Ratings:
 - a. Indoor Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
- F. In Grade Enclosures, Boxes And Covers:
 - 1. required to conform to all test provisions of the most current ANSI/SCTE 77 for Tier 22 applications.
 - 2. When multiple "Tiers" are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating.
 - 3. All covers are required to have the Tier level rating embossed on the surface. In no assembly can the cover design load exceed the design load of the box.

4. Cover to be labeled per use of box, ie "Electrical, Communications, etc". Communications pull boxes shall be a minimum of 24"W X 36"L X 36 "D.

2.04 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime- coat finish ready for field painting.

2.05 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: Comply with ANSI C80.1 and UL 6; Galvanized rigid steel, each length with a coupling on one end and thread protector on opposite end.
- B. Aluminum Rigid Conduit: Comply with ANSI C80.5 and UL 6A; Rigid aluminum, each length with a coupling on one end and thread protector on opposite end.
- C. IMC: Comply with ANSI C80.6. and UL 1242.
- D. Plastic-Coated Steel Conduit and Fittings: Comply with NEMA RN 1; PVC-coated RSC with 0.040 inch (1 mm), minimum coating thickness.
- E. EMT and Fittings: ANSI C 80.3 and UL 797
- F. FMC: Aluminum
- G. LFMC: Comply with UL 360; Flexible steel conduit with neoprene jacket and copper grounding strand.
- H. Conduit fittings for Hazardous (Classified) Locations: Comply with UL 886.
- I. Fittings for RSC, RAC and IMC: Provide factory made threaded couplings of same material as the conduit.
 1. Molded thermoplastic insulating bushing at all boxes and cabinets, with locknuts inside and outside box or cabinet. In wet locations, provide watertight hubs for conduit entry into enclosures.
 2. Thermoplastic insulated grounding bushing on all conduits where grounding bushings are required, with locknuts inside and outside the enclosure. In wet locations provide watertight hubs for conduit entry into enclosures.
 3. Provide bushings on all conduits 1" or larger.
- J. Fittings for EMT:
 1. Steel, set-screw or compression couplings.
 2. Steel, set-screw or compression insulated throat box connectors with molded thermoplastic insulating bushing at all boxes and cabinets, with locknuts inside box or cabinet.
 3. Steel, set-screw or compression insulated throat box connectors with thermoplastic insulated grounding bushing on all tubing where grounding bushings are required.
 4. Insulated throat material for fittings to be of a color that is easily distinguishable;

- clear thermoplastic throats are not acceptable.
- 5. Provide bushings on all conduits 1" or larger.
- 6. Provide thermoplastic bushings on all conduits for telecommunications, data, fire alarm cabling and similar.
- K. Fittings for FMC and LFMC:
 - 1. Adapters at connections between flexible and rigid conduit.
 - 2. Thermoplastic insulated throat, steel connectors at box or cabinet terminations.
 - 3. Insulated throat material for fittings to be of a color that is easily distinguishable; clear thermoplastic throats are not acceptable.
- L. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable:NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
- M. Joint Compound for RSC or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

PART 3.00 EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: RSC, RAC, or IMC.
 - 2. Concealed: RSC, RAC, or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Emergency Feeders: RSC
 - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 7. Boxes and Enclosures: NEMA 250, Type 3R, unless otherwise indicated.
- B. Indoors:
 - 1. Exposed, Not Subject to Physical Damage: EMT.Concealed: EMT.
 - 2. Exposed and Subject to Physical Damage: RSC, or IMC.
 - 3. Concealed within Masonry Walls: RSC, or EMT.
 - 4. Concealed under Raised Floors: EMT or LFMC.
 - 5. Conductors over 600 volts: RAC, RSC, or IMC.
 - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 7. Damp or Wet Locations above Ground: RAC, RSC, or IMC
 - 8. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size:
 - 1. Branch Circuits:3/4-inch (21mm) trade size

- 2. Feeder Circuits: 3/4-inch (21mm)
- D. Provide minimum 1/2-inch (16-mm) conduit for controls circuiting.
- E. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. RAC, RSC and IMC: Use threaded fittings, unless otherwise indicated.
- F. Junction and Pull Boxes: Sheet steel boxes, unless noted or required otherwise.
 - 1. Provide boxes no smaller than 4 inches square and 1-1/2 inches deep.
 - 2. Size all junction and pull boxes in accordance with the NFPA 70, unless project conditions dictate use of larger boxes.
- G. Outlet and Device Boxes: Sheet steel boxes, unless noted or required otherwise.
 - 1. For Lighting Fixture Outlets: 4 inch square with raised fixture ring.
 - 2. For Wall Switches, Receptacles, and Communication Use: 4 inch square, one-piece. Use boxes with plaster rings in all plastered walls where wall thickness permits. Use boxes less than 1-1/2 inch deep only in locations where deep boxes cannot be accommodated by construction.
 - 3. Boxes Used Outdoors or in Damp/Wet Locations: Cast metal boxes with gasketed covers and threaded hubs.

3.02 INSTALLATION

- A. Install raceways a minimum of 6-inches (150 mm) away from parallel runs of flues, steam pipes, hot-water pipes, and other objects operating at high temperatures
- B. Install horizontal raceway runs above water and steam piping. Install raceways a minimum of 1-inch (25.4-mm) from pipe insulation.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in "Basic Electrical Requirements."
- E. Install temporary closures to prevent foreign matter from entering raceways.
- F. Recessed Boxes in Fire-Rated Partitions: For boxes located on opposite sides of same partition do not install boxes back-to-back; separate boxes with a minimum of 24 inch separation
- G. Do not install aluminum conduits in contact with concrete.
- H. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- I. Conceal conduit:
 - 1. EMT shall be installed within finished walls, ceilings, and floors, unless otherwise indicated.
 - 2. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless

- otherwise indicated.
3. On concealed conduit systems where boxes are not otherwise accessible, set boxes flush with finished surfaces for access, and provide overlapping covers.
- J. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
- K. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- L. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors.
- M. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- N. Stub-up Connections:
1. Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor.
 2. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
 3. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
 4. Change from ENT to RAC, RSC, or IMC before rising above the floor.
- O. Flexible Conduit Connections:
1. Use minimum of 72 inches at final connections to equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 2. Use LFMC in damp or wet locations subject to severe physical damage including mechanical equipment rooms, at motor or equipment locations at or near pumps, and when installed outdoors.

- 3. Use LFMC in damp or wet locations not subject to severe physical damage.
- P. Install covers on junction boxes and conduit bodies after wiring and connections are completed.
- Q. Run conductors over 48 Volts in raceway, unless otherwise indicated.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Pull Boxes:
 - 1. Install no more than the equivalent of three 90-degree bends and a maximum of 150 feet between pull points in any conduit run except for communications conduits, for which fewer bends are allowed.
 - 2. Provide boxes where shown and where necessary for the installation and pulling of cables and wires.
- T. Pull Wires:
 - 1. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength.
 - 2. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.03 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.04 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16140 - WIRING DEVICES

PART 1.00 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. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Tamper-proof receptacles.
 - 3. Twist-locking receptacles.
 - 4. Snap switches and wall-box dimmers.
 - 5. Solid-state fan speed controls.
 - 6. Wall-box motion sensors.
 - 7. Wall-switch occupancy sensors and time switches.
 - 8. Pendant cord-connector devices.
 - 9. Cord and plug sets.

1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Receptacles, switches, plates, floor outlets, poke through assemblies, service poles and multioutlet assemblies.
- B. Samples: One for each type of device and wall plate specified, in each color specified.

1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70 latest edition or edition enforced by state or local code authority.

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Receptacles: Duplex 125 V, 20 A:
 - a. Hubbell - HBL 5362.
 - b. Leviton Mfg. Company Inc.-5362.
 - c. Pass & Seymour-CRB5362.
 - d. Pass & Seymour -PT5362A (Plug Tail Device).
 - 2. GFI Receptacles: Weather Resistant 125 V, 20 A:
 - a. Hubbell Incorporated- BR20WR
 - b. Leviton Mfg. Company Inc.-WBR20
 - c. Pass & Seymour- WR5362.
 - 3. GFI Receptacles: Weather Resistant and Tamper Resistant 125 V, 20 A:
 - a. Hubbell - BR2WRTR.
 - b. Leviton Mfg. Company Inc.-TWR20
 - c. Pass & Seymour- WR20TR.
 - 4. Receptacles: Tamper Resistant 125 V, 20 A:
 - a. Hubbell - BR20TR.
 - b. Leviton Mfg. Company Inc.-TWR20
 - c. Pass & Seymour- TR5362.
 - 5. Switches-Single Pole:
 - a. Hubbell- HBL 1221.
 - b. Pass & Seymour - PS20AC1.
 - c. Leviton Mfg. Company, Inc.- 1221-1
 - 6. Switches-Three Pole:
 - a. Hubbell- HBL1223
 - b. Leviton Mfg. Company, Inc.-1223-2.
 - c. Pass & Seymour-PS20AC3.
 - 7. Switches – Occupancy Sensor Wall Type:
 - a. Hubbell - LH-MT
 - b. Leviton - OD15-ID
 - c. Sensor Switch - WSD-PD
 - d. Watt Stopper - WA-200
 - 8. Switches – Key Operated / Security Switches:
 - a. Hubbell - HBL1221RKL.
 - b. Leviton - 1221-2KL
 - c. Pass & Seymour - PS20AC1-KL.
 - 9. Dimmer Switches Line Voltage:
 - a. Lutron Nova T

- b. Pass & Seymour CD2000
 - * Dimmer must be compatible with Ballast or LED Driver.
- 10. Dimmer Switches 0-10V:
 - a. Synergy ISD
 - b. Cooper SF10P
 - * Dimmer must be compatible with Ballast or LED Driver.

2.02 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with UL 498, 20 amp.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade 20 amp.
- C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.
- D. Tamper resistant in all public areas.

2.03 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.04 SWITCHES

- A. Single- and Double-Pole Switches: Comply with UL 20, 20 amp.
- B. Snap Switches: Heavy-Duty grade, quiet type 20 amp, 120/277 volt.
- C. Live Voltage Dimmer: 120V, 2000 watt, slide to-off. Dimmer must be compatible with ballast or driver.
- D. 0-10V Dimmer: 120/277VAC, capable of three way, max wattage 1200 w 120VAC, 150000 277 VAC, Dimmer must be compatible with ballast or driver. 100% to 1% continuous.

2.05 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: As selected by Architect.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed

and labeled for use in "wet locations."

- B. Wet-Location, Weatherproof Cover Plates:
 - 1. NEMA 250, complying with type 3R weather-resistant while-in-use metal or impact-resistant thermoplastic with lockable cover; non-removable gasket between the mounting plate/base and cover; stainless steel hinges and mounting hardware

2.06 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 - 1. Service Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks.
 - 2. Size: Selected to fit cored holes in floor and matched to floor thickness.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.07 SPECIAL CONFIGURATION & TWIST-LOCKING RECEPTACLES

- A. General: NEMA and Non-NEMA configurations as indicated on Drawings.
 - 1. Comply with NEMA WD 1, NEMA WD 6; and UL 498.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell
 - b. Leviton
 - c. Pass & Seymour

2.08 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.2.
 - 2. Wiring Devices Connected to Emergency Power System: Red.

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

- C. Remove wall plates and protect devices and assemblies during painting.
- D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- E. Install weather resistant receptacles in damp and wet locations per N.E.C. requirements.
- F. Mounting Heights: Comply with applicable codes and requirements of Authorities Having Jurisdiction. Mount devices as indicated on Drawings, including but not limited to Architectural elevations. Coordinate all above counter receptacles with backsplash to avoid interferences. All dimensions are given to centerline of box above finished floor (AFF), unless otherwise indicated.
- G. Device Plates and Covers:
 - 1. Do not use oversized or extra-deep plates.
 - 2. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
 - 3. Install weather-proof-while-in-use covers over receptacles in wet, damp and exterior locations.
 - 4. Group adjacent devices under single, multigang wall plates.
- H. Floor Service Outlets, Service Poles and Poke-Thru Device
 - 1. Adjust locations of floor service outlets, service poles, and Poke-Thru devices to suit arrangement of partitions and furnishings. Coordinate revised location with Structural Engineer.

3.02 APPLICATION

- A. GFCI Receptacles: Install in locations as indicated but in no case less than those listed below:
 - 1. Where device is located on the exterior of the building, provide with Wet-Location Weatherproof Cover Plate.
 - 2. Where device is located within kitchen.
 - 3. Where device is located within a garage.
 - 4. Where device is located within 6 feet (2-m) of a lavatory or sink
- B. Tamper-Resistant Receptacles: Install in locations as indicated but in no case less than those listed below:
 - 1. Dorms

3.03 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-

tightening values.

3.04 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

3.05 CLEANING

- A. On completion of wall plate installation, inspect exterior surfaces and perform the following:
 - 1. Remove paint splatters and other spots.
 - 2. Remove all temporary markings and labels.
 - 3. Replace cracked or damaged wall plates.
 - 4. Wipe down all wall plates with approve cleaning agent to remove fingerprints and dust.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16210 - UTILITY COORDINATION SERVICE ENTRANCE

PART 1.00 GENERAL

1.01 WORK INCLUDED

- A. General: Electrical service shall be provided by local utility company. Provide infrastructure, conduit, ductbanks and pathways from public street right-of-way to building for telecommunications and cable service.
- B. Power Company Data: Obtain from utility company information and installation standards for electrical, telecommunication, and cable service installation.
- C. Responsibilities: Determine what equipment and labor is provided by utility company and what equipment and labor is required of this Contractor.

PART 2.00 PRODUCTS

2.01 PRIMARY SERVICE

- A. General: Division 26 shall provide primary service conduit, manholes, and pull boxes as required and as specified for electrical service. Division 26 shall provide grounding rods, grounding conductors, sleeves, conduits, pull boxes and manholes as required by telecommunications and cable service providers.
- B. Electric utility company shall provide transformer, primary cables, splices, terminations, and primary underground and overhead service conductors. Telecommunications and cable service utility companies shall provide cabling and connections to the Owner's demarcation point of service.

2.02 SECONDARY SERVICE CABLE TAP BOXES

- A. When required by local utility company contractor shall provide a NEMA-3R demarcation junction box per company standards.

2.03 SECONDARY SERVICE CONDUCTORS

- A. General: Division 26 shall provide secondary service entrance conduit.
- B. Where required by local utility standards provide in-grade pull boxes.

2.04 DISCONNECTING MEANS

- A. When required by the local utility company for a 480V service, contractor shall provide a non-fused disconnect on the line side of the meter (cold-sequence).

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. The installation of the service entrance provisions shall comply with the published standards and requirements of the utility company, the utility company's specific construction requirements for this project, and with requirements of this Division.
- B. Any failure to meet the standards and requirements shall be corrected to the satisfaction of the utility company and Owner without any additional cost to the Owner.
- C. Contractor shall provide all construction materials and labor that the utility company determines to be the responsibility of the customer, at no additional cost to the Owner.
- D. The materials and labor required by the for a complete installation shall be provided by the contractor and includes, but is not limited to permanent or removable / lockable vehicular barriers, grounding rods, grounding conductors, sleeves, concrete pads, conduits, metering racks and metering enclosures.
- E. Primary distribution poles and service entrance ductbank locations shall be staked and surveyed prior to pole installation by the Contractor to verify their proper placement is within the Owner's property and respective utility easements. Contractor shall verify by survey that the pole and service entrance ductbank location and easements do not interfere with existing easements, right-of-ways, or other restricted properties. Conflicts with existing easements and restrictions shall be brought to the attention of the Architect prior to construction.
- F. Contractor shall initiate contact with the utility providers and Owner within 14 days of Notice to Proceed to ensure permanent power will be available to the site. Any delays resulting from lack of this coordination shall be the responsibility of the Contractor.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16230 - NATURAL GAS GENERATOR

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

1.03 DEFINITIONS

- A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the ESP unless otherwise agreed by the RIC engine manufacturer.
- B. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
 - 3. Sound test data, based on a free field requirement.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.
 - 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 - 2. Wiring Diagrams: Control interconnection, Customer connections.
- C. Certifications:
 - 1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.05 INFORMATIONAL SUBMITTALS

- A. Source quality-control test reports.
 - 1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.
 - 2. Certified Test Report: Provide certified test report documenting factory test

per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.

3. List of factory tests to be performed on units to be shipped for this Project.
4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

B. Warranty:

1. Submit manufacturer's warranty statement to be provided for this Project.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.
- C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).
- E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702
- F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.
- G. Comply with UL 2200.

1.07 PROJECT CONDITIONS

- A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: 4.44 deg C (40.0 deg F) to 51.11 deg C (124.0 deg F).
 2. Relative Humidity: 0 to 95 percent.
 3. Altitude: Sea level to 60.0 feet (18.29 m).

1.08 WARRANTY

- A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.
- B. Extended Warranty: Manufacturer shall offer extend coverage of 5 years from date of registered commissioning and start-up.

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: The basis for this specification is Cummins Power Generation equipment, approved equals may be considered if equipment performance is shown to meet the requirements herein.

2.02 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
 - 1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.
- C. Capacities and Characteristics:
 - 1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 150.0, at 80 percent lagging power factor, 208/120, Series Wye, Three phase, 4 -wire, 60 hertz. Output breaker rating shall be: 250A/3P
 - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.
- D. Generator-Set Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 1.0 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 3 seconds.
 - 6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.
 - 7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.
 - 8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.
 - 9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

2.03 ENGINE

- A. Fuel: Natural Gas
- B. Rated Engine Speed: 1800RPM.
- C. Lubrication System: The following items are mounted on engine or skid:
 - 1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.
 - 2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
 - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions
 - 1. Dual Fuel System (Natural Gas (with LPG Liquid or Vapor withdrawal))
 - a. Carburetor.
 - b. Fuel-Shutoff Solenoid Valves: One for each fuel source.
 - c. Flexible Fuel Connectors: One for each fuel source.
- E. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.
 - 1. Designed for operation on a single 120 VAC, Single phase, 60Hz power connection. Heater voltage shall be shown on the project drawings.
 - 2. Installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss.
 - 3. Provided with a 24VDC thermostat, installed at the engine thermostat housing
- F. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.
- G. Cooling System: Closed loop, liquid cooled
 - 1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.
 - 2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - 3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 - 4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 - 5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.
- H. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.
- I. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.
- J. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.
 1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 2. Cranking Cycle: As required by NFPA 110 for level 1 systems.
 3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.
 4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.
 5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.
 6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:
 - a. Operation: Equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.
 - f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.04 CONTROL AND MONITORING

- A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.
- B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.
- D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.
- E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
 - 1. AC voltmeter (3-phase, line to line and line to neutral values).
 - 2. AC ammeter (3-phases).
 - 3. AC frequency meter.
 - 4. AC kVA output (total and for each phase). Display shall indicate power flow direction.
 - 5. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
 - 6. Emergency Stop Switch: Switch shall be a red "mushroom head" pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
 - 7. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
 - 8. DC voltmeter (alternator battery charging).
 - 9. Engine-coolant temperature gage.
 - 10. Engine lubricating-oil pressure gage.
 - 11. Running-time meter.
 - 12. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)
 - 13. AC Protective Equipment: The control system shall include over/under voltage, over current, short circuit, loss of voltage reference, and over

excitation shut down protection. There shall be an overload warning, and overcurrent warning alarm.

14. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.
 15. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.
 16. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
 17. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).
- F. Remote Alarm Annunciator: Comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition.
- G. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.05 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:
1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
 2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm conditions when the current flow is in excess of 110% of rated current for more than 10 seconds.
 3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.
 4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.
 5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.
 6. The protective system provided shall not include an instantaneous trip function.

2.06 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.

- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H
- D. Temperature Rise: 105 / Class F environment.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
- G. Enclosure: Drip-proof.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, 3-phase true RMS sensing, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.
- I. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- J. Subtransient Reactance: 12 percent maximum, based on the rating of the engine generator set.

2.07 OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Sound Attenuated Aluminum housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.
- B. Construction:
 - 1. Louvers: Equipped with bird screen to permit air circulation when engine is not running while excluding birds and rodents.
 - 2. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.
 - 3. Exhaust System:
 - a. Muffler Location: Within enclosure.
 - 4. Hardware: All hardware and hinges shall be stainless steel.
 - 5. Wind Rating: Wind rating shall be 150 mph
 - 6. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.
 - 7. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.
 - 8. Inlet ducts shall include rain hoods
- C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.
- D. Sound Performance: Reduce the sound level of the engine generator while operating

at full rated load to a maximum of 76 dBA measured at any location 23 ft from the engine generator in a free field environment.

E. Site Provisions:

1. Lifting: Complete assembly of engine generator, enclosure shall be designed to be lifted into place as a single unit, using spreader bars.

2.08 VIBRATION ISOLATION DEVICES

A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

1. IBC Compliance: Isolators complying with IBC requirements shall be specified in the equipment documentation, as well as the installation requirements for the unit.

2.09 FINISHES

A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.10 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Steady-state governing.
6. Single-step load pickup.
7. Simulated safety shutdowns.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

PART 3.00 EXECUTION

3.01 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation,

application, and alignment instructions and with NFPA 110.

- B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- D. Contractor shall coordinate remote pushbutton location (when required) with engineer prior to installation. Provide allowance for 75' of conduit and required cabling unless otherwise located on plans.
- E. Contractor shall provide all interconnections and conduit between generator and remote annunciator including conduit and cabling.
- F. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- G. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.
- H. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.
- I. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.02 ON-SITE ACCEPTANCE TEST

- A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:
- B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.
- C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

- D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.03 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.05 SERVICE AND SUPPORT

- A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of \$3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 100 miles of the site.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16401 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1.00 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 a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.03 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.

1.04 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.

1.05 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.

1.06 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 2.00 PRODUCTS

2.01 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.

2.02 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:
 - 1) Based on fault-point X/R ratio.
 - 2) Based on calculated symmetrical value multiplied by 1.6.
 - 3) 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 2.00 EXECUTION

3.01 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.
 - 4. Obtain all arc flash information from the local utility in a timely manner. No extension of the contract time shall be permitted due to coordination with the local utility.
- 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).

3.02 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.

3.03 ADJUSTING

- A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.04 DEMONSTRATION

- A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION

DIVISION 16 – ELECTRICAL
SECTION 16402 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1.00 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 computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1.03 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.

1.04 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.

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.

1.06 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:
 - 1) One-line diagram.
 - 2) Protective device coordination study.
 - 3) Time-current coordination curves.
 - b. Power system data.

1.07 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 2.00 PRODUCTS

2.01 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.

2.02 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:
 - 1) Device tag.

- 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value
 - 3) Recommendations on improved relaying systems, if applicable.
 - b. Circuit Breakers:
 - 1) Adjustable pickups and time delays (long time, short time, ground).
 - 2) Adjustable time-current characteristic.
 - 3) Adjustable instantaneous pickup.
 - 4) 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 3.00 EXECUTION

3.01 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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

DIVISION 16 – ELECTRICAL
SECTION 16403 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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.

1.03 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.

1.04 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.

1.05 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.

1.06 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.

1.07 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 2.00 PRODUCTS

2.01 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.

2.02 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.

2.03 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 3.00 EXECUTION

3.01 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.

3.02 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 16402 "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.

3.03 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.

3.04 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.

3.05 APPLICATION OF WARNING LABELS

- A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.06 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

DIVISION 16 – ELECTRICAL

SECTION 16410 - TVSS FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1.00 GENERAL

1.01 SUMMARY

- A. This Section includes Transient Voltage Surge Suppression for low-voltage power, control, and communication equipment.

1.02 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.
- B. Product Certificates: For transient voltage suppression devices, signed by product manufacturer certifying compliance with the following standards:
 - 1. UL 1283.
 - 2. UL 1449.
 - 3. MIL-STD 220A. Conduct spectrum analysis of each unit based on test procedures between 50kHz and 200kHz indicating the device noise attenuation.
 - 4. ANSI/IEEE C62.41 and ANSI/IEEE C62.45: Provide certified documentation of applicable Location Category Testing in full compliance guidelines.
- C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data.
 - 1. Include electrical characteristics and ratings for the specified equipment.
 - 2. Include wiring diagrams indicating the internal connections of the specified equipment within its enclosure.
 - 3. Indicate device dimensions, weights, mounting provisions, and connection details.
- D. Warranty: Warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.
- E. Operation and Maintenance Data: For transient voltage suppression devices to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA

70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."
- D. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."
- E. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.05 COORDINATION

- A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within ten years from date of Substantial Completion.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Replaceable Protection Modules: One of each size and type installed.

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business
 - 2. Eaton
 - 3. Siemens Industry, Inc
 - 4. Square D

2.02 COMMON REQUIREMENTS FOR SUPPRESSORS

- A. Surge Protection Device Description: Modular design with field-replaceable modules, sine-wave-tracking type with the following features and accessories:
 - 1. Fuses, rated at 200-kA interrupting capacity.
 - 2. Fabrication using bolted compression lugs for internal wiring.
 - 3. Redundant suppression circuits.

4. Redundant replaceable modules.
 5. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 6. LED indicator lights for power and protection status.
 7. Audible alarm, with silencing switch, to indicate when protection has failed.
 8. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
 9. Surge-event operations counter: Six-digit transient counter set to total all transient surges that deviate from the fundamental sine wave by more than 125V.
 10. Normal Audible Noise less than 0dB.
 11. EMI/RFI Noise attenuation: Exceeding 55dB at 100kHz, using 50 ohm insertion loss test.
 12. Magnetic Fields: No appreciable magnetic fields shall be generated. The device shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.
 13. Leakage Current less than 1mA.
- B. Integral Disconnect Switch (If Required, Refer to "Installation of Surge Protection Devices")
1. The device shall have an optional NEMA compliant safety interlocked integral disconnect switch with an externally mounted metal manual operator.
 2. The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.
 3. The switch shall be rated for 600Vac.
 4. The SPD device shall be tested to UL1449 3rd Edition listed with the integral disconnect switch and the UL1449 VPR ratings shall be provided.
 5. The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
 6. The line side of the integral disconnect shall be blocked off so that when the SPD is opened there is no direct access to the voltage present on the line side of the disconnect.

2.03 SERVICE ENTRANCE SUPPRESSORS (CAT C)

- A. Service Entrance Suppressors to meet "Common Requirements for Suppressors" listed above, unless otherwise indicated.
- B. Maximum Category C combination wave clamping voltage shall not exceed the following:
1. 600V, line to neutral and line to ground on 120/208 V systems.
 2. 1000V, line to neutral and line to ground on 277/480 V systems
- C. Withstand Capabilities: 3000 Category C surges with less than 5 percent change in clamping voltage.
- D. Peak Single-Impulse Surge Current Rating:

1. 320/160 kA per phase/mode.
- E. Connection Means: Permanently wired.
- F. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277, 3- phase, 4-wire circuits shall be as follows:
1. For Non-Fused Devices:
 - a. Line to Neutral: 800 V for 480Y/277.
 - b. Line to Ground: 800 V for 480Y/277.
 - c. Neutral to Ground: 800 V for 480Y/277.
 2. For Fused Devices:
 - a. Line to Neutral: 1000 V for 480Y/277.
 - b. Line to Ground: 1000 V for 480Y/277.
 - c. Neutral to Ground: 1000 V for 480Y/277.

2.04 DISTRIBUTION PANELBOARD SUPPRESSORS (CAT B)

- A. Distribution Panelboard Suppressors to meet “Common Requirements for Suppressors” listed above, unless otherwise indicated.
- B. Maximum Category B combination wave clamping voltage shall not exceed the following:
1. 600V, line to neutral and line to ground on 120/208 V systems.
 2. 1000V, line to neutral and line to ground on 277/480 V systems
- C. Withstand Capabilities: 3000 Category B surges with less than 5 percent change in clamping voltage.
- D. Peak Single-Impulse Surge Current Rating:
1. 240/120 kA per phase/mode.
- E. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277, 3- phase, 4-wire circuits shall be as follows:
1. For Non-Fused Devices:
 - a. Line to Neutral: 800 V for 480Y/277.
 - b. Line to Ground: 800 V for 480Y/277.
 - c. Neutral to Ground: 800 V for 480Y/277.
 2. For Fused Devices:
 - a. Line to Neutral: 1000 V for 480Y/277.
 - b. Line to Ground: 1000 V for 480Y/277.
 - c. Neutral to Ground: 1000 V for 480Y/277.

2.05 LIGHTING AND APPLIANCE PANELBOARD SUPPRESSORS (CAT A)

- A. Lighting and Appliance Panelboard Suppressors to meet “Common Requirements for Suppressors” listed above, unless otherwise indicated.
- B. Maximum Category B combination wave clamping voltage shall not exceed the following:
1. 600V, line to neutral and line to ground on 120/208 V systems.
 2. 1000V, line to neutral and line to ground on 277/480 V systems

- C. Withstand Capabilities: 3000 Category B surges with less than 5 percent change in clamping voltage.
- D. Peak Single-Impulse Surge Current Rating:
 - 1. 80/40 kA per phase/mode.
- E. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 480Y/277 or 208Y/120, 3-phase, 4-wire circuits shall be as follows:
 - 1. For Non-Fused Devices:
 - a. Line to Neutral: 800 V for 480Y/277 and 400 V for 208Y/120.
 - b. Line to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.
 - c. Neutral to Ground: 800 V for 480Y/277 and 400 V for 208Y/120.

2.06 ENCLOSURES

- A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3.00 EXECUTION

3.01 INSTALLATION OF SURGE PROTECTION DEVICES

- A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
 - 1. Provide multipole, 60-A frame circuit breaker as a dedicated disconnect for suppressor, unless otherwise indicated. Comply with manufacturer's written recommendation for conductor and trip rating of circuit-breaker for connecting TVSS devices to distribution system. Match circuit-breaker size to conductor size.
 - 2. Where the panel on plan does not indicate a dedicated breaker for SPD. An integral disconnect shall be provided as described in "Common Requirements For Suppressors"

3.02 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency as defined in Division 26 Section "Common Work Results for Electrical" to perform the following field tests and inspections and prepare certified test reports:
 - 1. After installing surge protection devices, but before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Complete startup checks according to manufacturer's written instructions.

3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS 7.19.1, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.

3.03 CLEANING

- A. Clean components according to manufacturer's written instructions.
- B. Prior to installation of front trim and cover plates inspect interior surfaces and perform the following:
 1. Remove paint splatters and other spots.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16440 – AUTOMATIC TRANSFER SWITCHES

PART 1.00 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes transfer switches rated 600 V and less, including the following:
 - 1. Automatic transfer switches
 - 2. Remote annunciation systems
- B. Related Sections include the following:

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
 - 1. Technical data on all major components of all transfer switches and other products described in this section. Data is required for the transfer switch mechanism, control system, cabinet, and protective devices specifically listed for use with each transfer switch. Include steady state and fault current ratings, weights, operating characteristics, and furnished specialties and accessories.
 - 2. Single Line Diagram: Show connections between transfer switch, power sources and load.
- B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
 - 1. Dimensioned outline drawings of assembly, including elevations, sections, and details including minimal clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch specified.
 - 2. Internal electrical wiring and control drawings.
 - 3. Interconnection wiring diagrams, showing recommended conduit runs and point-to-point terminal connections to generator set.
 - 4. Installation and mounting instructions, including information for proper installation of equipment to meet seismic requirements.
- C. Manufacturer and Supplier Qualification Data
 - 1. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.
 - 2. The manufacturer of this equipment shall have produced similar equipment for a minimum period of 10 years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. Operation and Maintenance Data: For each type of product to include in emergency,

operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays, timers and protective devices; provide setting and calibration instructions where applicable.

- E. Warranty documents demonstrating compliance with the project's contract requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than (eight hours or appropriate time period designated for Project) from time of notification.
1. The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
 2. Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.
 3. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.
- B. Source Limitations: All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.
- D. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:
1. Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.
 2. CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment
 3. NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.
 4. Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches
 5. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 6. EN55011, Class B Radiated Emissions and Class B Conducted Emissions
 7. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity
 8. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
 9. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
 10. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity

11. IEC 1000-4-6 Conducted Field Immunity
 12. IEC 1000-4-11 Voltage Dip Immunity
 13. IEEE 62.41, AC Voltage Surge Immunity
 14. IEEE 62.45, AC Voltage Surge Testing
- E. Comply with NFPA 110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.
- F. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of five (5) year from the warranty start date. The warranty start date is the date of registered commissioning and start up or eighteen (18) months from date of shipment, whichever is sooner.
- G. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.

1.05 COORDINATION

- A. Size and location of concrete bases and anchor bolt inserts shall be coordinated. Concrete, reinforcement and formwork must meet the requirements specified in Division 03. See section "INSTALLATION" for additional information on installation

PART 2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cummins Power Generation
 2. ASCO
 3. Trystar (Docking stations & Manual Transfer Switches)
- B. Switches manufactured by other manufacturers that meet the requirement of this specification are acceptable, if approved not less than two weeks before scheduled bid date. Proposals must include a line-by-line compliance statement based on this specification.
- C. Transfer switches utilizing molded case circuit breakers do not meet the requirements of this specification and will not be accepted.

2.02 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

- A. Provide transfer switches in the number and ratings that are shown on the drawings.
- B. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.
- C. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.

- D. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of - 40 to + 60 degrees C (- 40 to + 140 degrees F).
- E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- F. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).
- G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
 - 1. Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.
 - 2. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.
 - 3. Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
 - 4. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
 - 5. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
 - 6. The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.
 - a. Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality
 - 7. Transfer switches designated on the drawings as "4-pole" shall be provided with a switched neutral pole which is switched simultaneously with phase poles.
 - 8. Transfer switches designated on the drawings as "service entrance" switches shall meet the requirements of section "SERVICE ENTRANCE TRANSFER SWITCHES" of this specification.
- H. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.
- I. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism
- J. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.

- K. Enclosures: All enclosures shall be third-party certified for compliance to NEMA ICS 6 and UL 508, unless otherwise indicated:
1. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70, regardless of the direction from which the conduit enters the enclosure.
 2. Exterior cabinet doors shall provide complete protection for the system's internal components. Doors must have permanently mounted key-type latches. Bolted covers or doors are not acceptable.
 3. Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.
 4. Indoor transfer switches shall be NEMA-1. Outdoor transfer switches shall be NEMA-3R.

2.03 AUTOMATIC TRANSFER SWITCHES

- A. Comply with requirements for Level 1 equipment according to NFPA 110.
- B. Indicated current ratings:
1. Refer to the Project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
 2. Main contacts shall be rated for 600 VAC minimum.
 3. Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000 meters).
- C. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.
- D. Control: Transfer switch control shall be provided with necessary equipment and software to communicate with the genset control, other transfer switches, remote annunciation equipment, and other devices over a high speed control network.
- E. Neutral Switching: Transfer switches designated on the drawings as 4-pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.
- F. Automatic Transfer Switch Control Features
1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
 2. All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.
 3. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device for load shedding purposes. On receipt of this signal, the transfer switch shall switch to a neutral position when

connected to Source 2. If Source 1 is available when the load-shed signal is received, the transfer switch shall connect to Source 1.

4. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
5. The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 60 seconds.
6. The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
7. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
8. The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational.

G. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. The panel shall also include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.

1. The indicator panel LEDs shall display:
 - a. Which source the load is connected to (Source 1 or Source 2)
 - b. Which source or sources are available
 - c. When switch is not set for automatic operation, the control is disabled
 - d. When the switch is in test/exercise mode
2. The indicator shall have pushbuttons that allow the operator to activate the following functions:
 - a. Activate pre-programmed test sequence
 - b. Override programmed delays, and immediately go to the next operation
 - c. Reset the control by clearing any faults
 - d. Test all of the LEDs by lighting them simultaneously
3. The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:
 - a. AC voltage for all phases, normal and emergency
 - b. Source status: connected or not connected.
 - c. Load data, including voltage, AC current, frequency, KW, KVA, and power factor.
4. The display panel shall be password-protected, and allow the operator to view and make adjustments:
 - a. Set nominal voltage and frequency for the transfer switch
 - b. Adjust voltage and frequency sensor operation set points
 - c. Set up time clock functions
 - d. Set up load sequence functions
 - e. Enable or disable control functions including program transition
 - f. View real-time clock data, operation log (hours connected, times transferred, failures) and service history

H. Control Functions: Functions managed by the control shall include:

1. Software adjustable time delays:
 - a. Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds (default 3 sec)
 - b. Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds (default 3 sec)
 - c. Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 3 sec)
 - d. Engine cooldown: 0 to 30 minutes (default 10 min)
 - e. Programmed transition: 0 to 60 seconds (default 3 sec)
 2. Voltage imbalance sensing:
 - a. Dropout: 2 to 10% (default 4%)
 - b. Pickup: 90% of dropout
 - c. Time delay: 2.0 to 20 seconds (default 5 sec)
 - d. Bar graph meter panel, to display 3-phase AC Amps, 3-phase AC Volts, Hz, KW load level, and load power factor. The display shall be color-coded, with green scale indicating normal or acceptable operating level, yellow indicating conditions nearing a fault, and red indicating operation in excess of rated conditions for the transfer switch.
 3. Phase rotation sensing:
 - a. Time delay: 100 msec
 4. Loss of single-phase detection:
 - a. Time delay: 100 msec
- I. Control features shall include:
1. Programmable genset exerciser: A field-programmable control shall periodically start and run the generator with or without transferring the load for a preset time period, then re-transfer and shut down the generator after a preset cool-down period.
 2. In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.
 3. The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.
 4. Re-Transfer Inhibit Switch: Inhibits automatic re-transfer control so automatic transfer switch will remain connected to emergency power source as long as it is available regardless of condition of normal source.
 5. Transfer Inhibit Switch: Inhibits automatic transfer control so automatic transfer switch will remain connected to normal power source regardless of condition of emergency source.
- J. Control Interface
1. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
 2. The transfer switch shall be provided with a network communication card, and configured to allow network-based communication with the transfer switch and other network system components, including the generator set(s) provided for the Project.
 3. Unassigned Auxiliary Contacts: Two normally open, 1-pole, double-throw contacts for each switch position, rated 10A at 240 VAC.
- K. Engine Starting Contacts
1. One isolated and normally closed pair of contacts rated 10A at 32 VDC

minimum.

2.04 SERVICE ENTRANCE TRANSFER SWITCHES

- A. Transfer switches must be specifically intended for service entrance applications, and labeled "Suitable for service entrance use only"
- B. Transfer switch shall meet NEC requirements for emergency, legally required and standby applications as specified in UL 1008.
- C. Entire transfer switch including enclosure must be listed and labeled to UL 1008; switches with only the mechanism listed are not acceptable.
- D. Molded case circuit breaker must be UL 489 listed.

2.05 MANUAL TRANSFER SWITCHES (MTS)

- A. The transfer switch unit shall be manually operated and mechanically held. The switch shall be mechanically interlocked to ensure only one of three possible positions, Source 1, Source 2, or Center Off Fused disconnect type switches shall not be acceptable.
- B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.
- E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- F. Where neutral conductors must be switched, the MTS shall be provided with fully- rated neutral transfer contacts.
- G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.
- H. The MTS shall be tested in accordance with UL 1008 for transfer switches. Switch ratings of 260 amperes and less shall have endurance rating of 6000 cycles, 400 ampere shall have endurance rating of 4000 cycles, and 600 – 1200 ampere shall have endurance rating of 3000 cycles.
- I. Operation:
 - 1. The transfer switch shall be arranged for manually actuated manual operation.
 - 2. The manual transfer shall be actuated via a mechanical operating mechanism.
 - 3. The manual operating handle shall be capable of external operation without opening the enclosure door.

4. It shall have the same contact to contact speed as automatic operation
 5. There shall be three positions for manual operation:
 - a. Connected to Source 1 (preferred)
 - b. Connected to Source 2 (alternate)
 - c. Connect to center off (disconnected position)
 6. Switch position when connected to Source 1, or Source 2 shall be pad – lockable
- J. Additional Features:
1. Mechanical position indicators (yellow) visible to the operator shall be included for Source 1 (preferred), Source 2, (alternate), and Center Off (disconnected).
 2. LED indicators for Source 1 (preferred), and Source 2 (alternate).
 3. Auxiliary position indicating contacts, rated 10 amps, 250 Vac shall be provided consisting of one closed when the MTS is connected to Source 1 (preferred), and one contact closed when the MTS is connected to Source 2 (alternate)
 4. A form A contact shall be provided to indicate switch is in the Center Off (disconnected) position.
 5. Auxiliary Contacts: Position indicating contacts, rated 10 amps, 250 Vac shall be provided consisting of two closed when the MTS is connected to Source 1 (preferred), and two contact closed when the MTS is connected to Source 2 (alternate).
 6. Integrated Quick Connects: contains quick connects which provide a connecting means for connecting a portable generator.
 - a. Quick connects shall be located on Source 2 (emergency):
 - 1) For 400A and below models, there shall be one (1) row of up to five (5) series single pole connections.
 - 2) For 600A - 800A models, there shall be two (2) rows of up to five (5) single pole connections.
 - 3) For 1000A-1200A models, there shall be three (3) rows of up to 5 single pole connections.
 - b. All electrical connections shall be 16 cam type single pole connectors, available color coded as per industry standard practice.
- K. Withstand and Closing Ratings:
1. The MTS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the MTS terminals with the type of overcurrent protection shown on the plans. WCR MTS ratings @ 480v shall be as follows when used with specific circuit breakers or current limiting fuses:

MTS Ampacity	Withstand & Closing Rating MCCB	W/CLF
150-600	50,000A	200,000
800-1200	65,000A	200,000

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Floor-mounted transfer switches (except drawout switches supported by wheeled carriages, which must be rolled out at floor level) shall be mounted on concrete bases complying with the following requirements:
 - a. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems." Where Section "Hangers and supports for Electrical Systems." Is not included in the spec book refer to Division 26 Section "Basic Electrical Requirements".
- C. Annunciator Panel Mounting: Flush in wall, unless otherwise indicated.
- D. Identify components according to Division 26 Section "Identification for Electrical Systems." Where section "Identification for Electrical Systems" is not included in the spec book refer to Division 26 section "Basic Electrical Requirements"
- E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.02 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
- C. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems." Where section "Grounding and Bonding for Electrical Systems" is not included in the spec book refer to Division 26 section "Basic Electrical Requirements"
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Where section "Grounding and Bonding for Electrical Systems" is not included in the spec book refer to Division 26 section "Basic Electrical Requirements"

3.03 SOURCE QUALITY CONTROL

- A. Prior to shipping, factory shall test and inspect components, assembled switches, and associated equipment to ensure proper operation.
- B. Factory shall check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.
- C. Factory shall perform dielectric strength test complying with NEMA ICS 1.

3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: The supplier of the transfer switch(es) and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.
- B. Manufacturer's representative shall perform tests and inspections and prepare test reports.
- C. After installing equipment and after electrical circuitry has been energized, installer shall test for compliance with requirements.
 - 1. Perform recommended installation tests as recommended in manufacturer's installation and service manuals.
 - 2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch.
 - a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
 - b. Verify time-delay settings.
 - c. Verify that the transfer switch is accurately metering AC voltage and current.
 - d. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 DEMONSTRATION

- A. After generator set installation, the generator and transfer switch supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the Owner.
 - 1. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures.
 - 2. The class duration shall be at least 8 hours in length, and include practical operation with the installed equipment.

3.06 SERVICE AND SUPPORT

- A. The manufacturer shall supply the Service Provider with a complete set of the service and maintenance software required to support the product. The software shall be

provided at a training class attended by the user, to qualify the user in proper use of the software. The software shall have the following features and capabilities:

1. The software shall allow adjustment of all functions described herein, adjustment of operating levels of all protective functions, and programming of all optional functions in the controller. Adjustments shall be possible over modem from a facility that is remote from the generator set.
2. The software shall be capable of storing and displaying data for any function monitored by the generator set control. This data shall be available in common file formats, and on graphical "strip chart" displays.
3. The software shall automatically record all control operations and adjustments performed by any operator or software user, for tracking of changes to the control.
4. The software shall display all warning, shutdown, and status changes programmed into transfer switch controller. For each event, the control shall provide information on the nature of the event, when it last occurred, and how many times it has occurred.

END OF SECTION

DIVISION 16 - ELECTRICAL
SECTION 16500 - LIGHTING

PART 1.00 GENERAL

1.01 LIGHTING SCHEDULE

- A. The Contractor shall install lighting fixtures and accessories as shown on the drawings and/or described herein. The Contractor shall also install lamps for all fixtures.

PART 2.00 PRODUCTS

2.01 LED LIGHTING

- A. Lighting fixtures with LED light sources shall meet the following fixture and light source requirements:
1. LED Color Temperature – Per Drawings
 2. CRI > 80
 3. Line Voltage – Universal Voltage 120-277 volts
 4. Governmental Standards – LM79 and LM80 Compliant
 5. Expected Lamp Life – LED Life Rating ($L_{70} B_{10}$) to be 60,000 hours to 100,000 hours; Defined as time of operation (in hours) to 30% lumen depreciation (i.e. 70% lumen maintenance), derived from Luminaire in-situ temperature measurement testing (i.e. LED chip package temperature (T_s) measurement obtained with the LED chip package operating in given luminaire and in a given stabilized ambient environment) under UL1598 environments and directly correlated to LED package manufacturers IESNA LM-80-08 data. Predicted ($L_{70} B_{10}$) Limits (@ 25°C luminaire ambient operating environment): Greater than 60,000 hours @ 350mA Drive Current
 6. Driver – Components must be fully encased in potting material for moisture resistance, and must comply with IEC and FCC standards
 7. Surge Protection – Surge protection must be provided including separate surge protection built into electronic driver
 8. Mechanical – Luminaire LED system components to be low copper aluminum, with high performance heat sink(s) designed specifically for LED luminaires. No active cooling features (Fans, etc.). Luminaire configuration must allow for modular upgradability and/or field repair of all electrical components (i.e. LED modules, Driver(s), etc.). Drivers and vertical light bars must be all mounted to a twist-lock tool-less assembly for ease of installation and trouble-shooting.

2.02 LIGHTING ACCESSORIES

- A. All lighting shall be equipped with the appropriate housing for the ceiling type shown on the architectural reflected ceiling plan.
1. GYP Ceilings –
 - a. 1'X4' 2'X2' & 2'X4' Troffers: Provide flange kit or surface mount kit. If not explicitly indicated on plan contractor shall price based on the more costly product and submit an RFI to Engineer prior to purchase.
 - b. Downlights: Provide recessed housing and appropriate flange kit.
 - c. Strip lighting: Provide surface mount kit. In areas with ceiling heights

- greater than 10' contractor shall provide chain suspension hardware.
- d. Architectural linear fixtures: Where indicated as recessed contractor shall provide flange kit or mud-in kit as required. If not explicitly indicated on plan contractor shall price based on the more costly product and submit an RFI to Engineer prior to purchase.

2. Grid Ceilings – Provide appropriate mounting hardware to recess fixtures into grid.

- B. Fire ratings: Lighting in fire rated ceiling shall be equipped with fire padding, caulking, and/or housings as required to maintain fire ratings. Contractor shall refer to architectural plans for all fire ratings prior to bid.
- C. Emergency battery backup and inverters:
 - 1. Where remote battery backup is utilized contractor shall coordinate all remote test switch locations with owner/architect prior to rough in. They shall not be located in ceiling adjacent to fixture.
 - 2. Where integral battery backup is utilized the fixture shall include self-diagnostics. This shall not be required if specified fixture does not include a self-diagnostic option.
 - 3. Where an inverter is utilized contractor shall provide UL924 transfer devices in the quantity required to accomplish control as shown on plans. Where inverter fixture utilized line voltage dimming contractor shall notify engineer immediately prior to bid.

2.03 OCCUPANCY SENSORS

- A. Sensor shall be a self-contained dual voltage ceiling mounted device capable of directly switching loads upon detection of human activity. Sensor must be circular, and mount to either a single gang enclosure, or surface mount to a round pancake box.
- B. Sensor must be rated for 120 through 277 VAC and be capable of switching zero to 1200 watts of electronic ballast loads. Sensors must be capable of parallel wiring for multi-sensor applications.
- C. Sensor time delay shall be factory set for typical applications, and field adjustable from 30 seconds to 20 minutes. Sensor must provide a green LED motion indicator. Red LED denoting life safety shall not be permitted.
- D. PIR sensing must utilize a high density Fresnel domed lens, providing a circular view pattern of at least 360 degrees by 56 degrees.
- E. Passive Dual Technology (PDT) sensing must incorporate PIR with Microphonics, which utilizes a passive microphone with automatic gain control (AGC) to sense both occupants moving and sounds. The PIR must be used to initiate an on condition, once on the PIR or Microphonics shall keep the load on. After the time delay expires and the load goes off, the Microphonics shall remain active up to 10 seconds as a back-up grace period.
- F. Wall box mounted occupancy sensors shall mount in a standard utility box. Sensor shall have self-contained relay (no power pack required), utilize PIR and microphonics

detection, and include auto sensitivity adjustment. Wall box sensor shall be intrinsically grounded and include ON/OFF switch and adjustable time delay.

- G. Occupancy Sensor:
 - 1. Ceiling mount for offices and restrooms – Lutron #LOS-CUS-1000-WH / PP-DV; Wattstopper UT-305-2/BZ-50; Sensor Switch CM PDT9
 - 2. Wall mount for offices, storage rooms, etc. – Lutron #MS+OPS6M-DV-color; Wattstopper WD-170-FINISH; Sensor Switch WSX
 - 3. Ceiling mount in large rooms – Lutron #LOS-CDT-2000WH, with #PP-DV universal power pack; Wattstopper DT-205 / BZ-50; Sensor Switch CM PDT10 with PP16
 - 4. Wall/ceiling mount at end of corridors – Lutron #LOS-WIR-WH / PP-DV 1600'ft coverage; Wattstopper CX-105 / BZ-50; Sensor Switch WV16 with PP16
 - 5. Wall/ceiling mount at center of corridors – Watt Stopper #CX-100-3 series, with #BZ-50 universal power pack; Sensor Switch WV16 with PP16
 - 6. Room controllers – Wattstopper #LMRC-101; nLight #nPP 16

2.03 FIXTURES

- A. Fixtures as described in the Fixture Schedule on the drawings shall be furnished by the Contractor and shall be properly installed.
- B. Where fixtures are specified with emergency remote test switches contractor shall coordinate location of remote test switch with Owner/Architect prior to installation.

PART 3.00 EXECUTION

3.01 INSTALLATION

- A. Unless otherwise specified, lighting fixtures shall be permanently installed and connected to the wiring system.
- B. The Contractor shall support each fixture, independently from the building structure. Ceiling framing members shall not be used to support fixtures except in specified areas where ceiling supports for this purpose have been specified elsewhere in these specifications. Each fixture shall have at least two fixture supports.
- C. Flexible conduit used for fixture whips shall be at least twelve (12) inches, but not more than 48 inches long.
- D. Site lighting poles shall include a foundation with a minimum depth below grade of 8'. Those located within parking areas shall extend from grade 3' in pedestrian areas a reduction in foundation height is permitted, refer to foundation drawings for specific pedestrian area requirements.

3.02 CEILING COMPATIBILITY

- A. Catalog numbers shown on the drawings or descriptions of lighting fixtures contained

herein may indicate fixture compatibility with certain types of ceiling construction. Contractor shall determine exact type of ceiling actually to be furnished in each area and shall obtain fixtures to suit, deviation from specified catalogue numbers or descriptions only where necessary and only to the extent necessary to insure fixture/ceiling compatibility.

3.03 LIGHT LEAKS

- A. The Contractor shall, at the end of this project, adjust all recessed lighting fixtures so that there will be no light leaks between the fixture trim and the ceiling. Contractor shall also adjust recessed fluorescent fixtures to eliminate any light leaks between fixture trim and ceiling grid member.

3.04 LAMPS

- A. The Contractor shall install lamps in all fixtures and shall obtain replacement lamps should any not properly operate or become damaged during construction.

3.05 EXIT FIXTURES

- A. Exit fixtures shall be installed according to Life Safety Code requirements, with face(s) plainly visible and directional arrows indicating the proper direction of egress.

END OF SECTION